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A REVISION OF *ANTHURIUM* SECTION *PACHYNEURIUM* (ARACEAE)[1]

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ABSTRACT

This is the first published revision of *Anthurium* sect. *Pachyneurium* since that of Engler in 1905. Section *Pachyneurium* is one of 19 sections (all but one of which were treated by Engler, 1905, in his revision of *Anthurium*). The section consists of 114 species representing 126 taxa in two series, series *Pachyneurium* Schott, and the new series *Multinervia* Croat, with 110 and 16 taxa respectively. Forty-eight taxa (including nine subspecies or varieties) are described as new.

Section *Pachyneurium* is one of 19 recognized for *Anthurium* and is perhaps the most easily recognizable and well-defined group in the genus. It was for this reason, despite its size and taxonomic difficulty, that this section was chosen as a starting point for a revision of the genus. Section *Pachyneurium* is generally defined by its frequently rosulate or "bird's-nest" habit, its short, densely rooted caudex, the commonly short-petiolate, oblanceolate to obovate, mostly coriaceous leaf blades with usually free-ending primary lateral veins and, most importantly, the involute vernation (rolled inward from both margins) of the developing leaves (Fig. 1). All other sections of *Anthurium*, and indeed all other genera of Araceae (except *Lagenandra*), have convolute vernation (Fig. 2), with one margin rolled inward toward the midrib and the other margin rolled around the midrib and the rolled up opposite margin (like a continuous coil in cross section).

The section consists of two series with most species in series *Pachyneurium*. The other series, *Multinervia*, is restricted to the Andes of South America, especially in Ecuador. Series *Pachyneurium* contains all the species originally included in grex *Pachyneurium* by Schott (1860), and most of those included by Engler (1905) in sect. *Pachyneurium*. Series *Multinervia* contains species unknown to Schott and mostly unknown to Engler. The few species of series *Multinervia* treated by Engler were incorrectly placed in sect. *Polyneurium* or in sect. *Urospadix*, the latter having been employed by Engler as a rather broad "dumping ground." See Appendixes 1 and 2, respectively, for the ultimate disposition of species treated in sect. *Pachyneurium* by Schott and by Engler. See Appendix 3 for the disposition of all currently recognized *Pachyneurium* species and their sectional placement in the revisions of both Schott and Engler.

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METHODS AND MATERIALS

This revision was based on field studies in Central America between 1967 and 1979 and in South America in 1969 (Colombia), 1972 (Peru), 1976 (Colombia and Ecuador), 1980, 1983, 1984 (western South America), 1984 (Venezuela), and 1986 (western South America and Brazil). All but 28 of the 125 taxa were studied live or are under cultivation at the Missouri Botanical Garden. Except for those so indicated, all descriptions can be assumed to have been prepared from both living and dried material. Morphological characters were coded directly into a computerized database to ensure parallel and sortable descriptions. The aroid descriptions database contains 228 characters that are used to describe the morphological diversity expressed by *Anthurium*. The database also provides a means of sorting species by characters for writing keys, as well as for compiling lists of various character states. In addition, the database can be put to future use for identifications and for additions of new species for other treatments. The description file is directly tied to a nomenclatural database containing all species names and publication data for all Araceae species stored in Tropicos (Crosby, 1986; Crosby & Magill, 1986). Each species is represented by a unique number, which ties it to data in other files associated with the species. Discussions and exsiccatae are also stored in separate files, as are synonyms, but all parts are automatically reassembled for the final treatment. Herbarium specimens can be added to the exsiccatae database at any time and sorted in a standardized manner before being printed out. Thus, exsiccatae records can be added up to the last moment, even when the manuscript has been completed. Species descriptions are decoded into narrative text automatically from the descriptor base and require only minor editing to put them in a publishable form. Final treatments may be saved on hard disk or stored on tape, but the coded description data (which use very little core storage space) are a part of the permanent Tropicos database and can be used for other projects such as floras or ecological studies.

The terminology and usage in the descriptions in this paper are defined by Croat & Bunting (1979). The color of the spadix, unless otherwise indicated, refers to the color at anthesis, i.e., when the spadix is producing stigmatic droplets or when fresh stamens are emerging. Colors referenced in the descriptions that follow are taken from the color chart by Berlin & Kay (1969). This is hereafter cited as B & K. This color chart, available from the University of California Press, is a reproduction of the Munsell Color Array of 40 hues, at maximum saturation, with nine degrees of brightness. The B & K color chart represents 40 hues in the vertical columns and nine degrees of brightness in the horizontal rows. Colors are arranged in 10 basic clusters with four different hues per cluster, ranging from red through yellow, green, blue, purple, and finally red-purple. The four columns for each color cluster are numbered 2.5, 5, 7.5, and 10. These numbers are repeated for each basic color type. The colors from the B & K color chart are read by first reporting the color, then the row followed by the column. For example, the third color in the fifth row in the red area would be called Red 5/7.5. The second color in the eighth row would be called Red 8/5.

All estimates of ecological zones given in this paper are based on either Holdridge Life Zone maps for most Central American countries and for Panama or on the "Mapa de tipos de vegetación de la República Mexicana" (Flores et al., 1971). As yet no study has been made to correlate the vegetation types represented on the Mexican map with those of the Holdridge Life Zone system. For an understanding of the latter system, see Holdridge et al. (1971). For South America, maps based on the Holdridge System were used for Bolivia, Colombia, Ecuador, Peru, and Venezuela.

Mention should be made of the distribution of herbarium material of Araceae under cultivation. Herbarium material may consist of one of three kinds: (1) fertile original (wild) collections; (2) sterile original collections with an inflorescence added from the cultivated plant of the same number (generally the same individual from which the field specimens were made); and (3) material collected entirely from the cultivated plant. Specimens based entirely or in part on cultivated material are clearly indicated as such in herbaria.

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HISTORY OF SECTION *PACHYNEURIUM*

The first species of sect. *Pachyneurium* as it is recognized here was described by Linnaeus (1763) in *Species Plantarum* as *Pothos crenata*, and was transferred to *Anthurium* by Kunth in 1841. Three other species clearly belonging to sect. *Pachyneurium* were described in the genus *Pothos: Pothos crassinervia* was described by Jacquin in 1793 and transferred to *Anthurium* by Schott in 1832. The other two were *Pothos solitarius* Vell. Conc. described in 1829, and *P. maxima* Desf., described in 1832. The former was transferred to *Anthurium* by Schott in his *Prodromus* (1860), while the latter was transferred to *Anthurium* by Engler in 1905 and is here treated as a nomen dubium owing to the inability to place it with certainty in any currently recognized species. The genus *Pothos* as now circumscribed is restricted to Africa and Asia, especially Southeast Asia. Modern suprageneric classifications do not place *Pothos* close to *Anthurium*. Grayum (1984) places it in a separate tribe, Potheae in the subfamily Pothoideae. Grayum considers *Anthurium* isolated but closer to *Pothos* than to any other genus. He places *Anthurium* in a separate tribe Anthurieae in the same subfamily. Bogner & Nicolson (in press) remove *Anthurium* from the Pothoideae altogether and place it in the subfamily Lasiodeae, leaving *Pothos* in the Pothoideae with only two other closely related genera, *Pedicellarum* and *Pothoidium*.

The epithet *Pachyneurium* was first used in 1860 by H. W. Schott in his first revision of the Araceae in *Prodromus Systematis Aroidearum*. Although no *Anthurium* species were treated in his earlier *Synopsis Aroidearum* in 1856, 20 species were treated in the *Prodromus*. Half of these were described by Schott himself in that work or in earlier works during the previous decade. Others were described by Karl Koch or Frederick Liebmann during the same decade. In addition to the four species described as *Pothos* mentioned above, only one species of sect. *Pachyneurium*, *A. crassinervium* (Jacq.) Schott (described as *Pothos crassinervia* in 1793), was described before the early 1850s. Three of the 20 names included in Schott's 1860 revision, namely *A. acaule* (Jacq.) Schott, *A. hookeri* Kunth and *A. aduncum* (Vell. Conc.) Schott, were published before 1850 but these have been excluded from *Pachyneurium* and placed in other sections (see Appendix 1).

Of the remaining *Pachyneurium* names in Schott's 1860 revision, only nine species remain. These include *A. wagenerianum* K. Koch & Bouché, *A. fendleri* Schott, *A. spectabile* Schott, *A. crassinervium* (Jacq.) Schott, *A. affine* Schott, *A. schlechtendalii* Kunth, *A. crenatum* (L.) Kunth (erroneously treated by both Schott and Engler as *A. acaule* (Jacq.) Schott (Mayo, 1982)), *A. dombeyanum* Brongn. ex Schott, and *A. solitarium* (Vell. Conc.) Schott. Still other species of sect. *Pachyneurium* were described in Schott's revision, but these he included in other groups (termed "greges" by Schott). These included *A. protensum* Schott (included in grex *Erythropodium*), *A. oxypum* Poeppig and *A. consobrinum* Schott (grex *Oxycarpium*), and *A. oerstedianum* Schott (including its synonym, *A. cuspidifolium* Schott) in grex *Xialophyllium*. Thus, a total of 13 species of *Pachyneurium* were included in Schott's revision, even though some were not recognized as such.

In Engler's 1905 revision, 62 names were included in sect. *Pachyneurium* (Appendix 2). Of this total, only 18 species were actual *Pachyneurium* species not already included in Schott's revision. Fourteen of the names included by Engler (in reality only 12 species, since two were synonyms), including *A. hookeri* Kunth, *A. hacumense* Engl., *A. weberbaueri* Engl., and all species numbered 52 through 62, have subsequently been proven to be non-*Pachyneurium* (see Appendix 2). Ten names included by Engler were synonyms of earlier names in Schott's revision, three names were synonyms of older names in Engler's own revision and four names have been excluded because of confusion in the nomenclature (see Species Excluded section). These are *A. maximum* (Desf.) Engl., *A. cymatophyllum* K. Koch & Sellow, *A. agnatum* Schott, and *A. tricarinatum* Sodiro.

In addition to the 18 species that Engler added to those Schott had included in his grex *Pachyneurium*, Engler included the following elsewhere: *A. oxycarpum* (sect. *Oxycarpium*), *A. pallatangense* Engl. (sect. *Polyneurium*), *A. oerstedianum* Schott (including *A. cuspidifolium* Schott, in sect. *Urospadix*, series *Obscureviridia*), *A. linguifolium* Engl. (sect. *Urospadix*, series *Flavescentiviridia*), and *A. spathiphyllum* N. E. Br. (sect. *Episeiostenium*). Of these, only *A. pallatangense* and *A. linguifolium* had not been treated by Schott.

Thus, in the 45 years between the publication of Schott's revision in 1860 and Engler's treatment for *Das Pflanzenreich* in 1905, an additional 22 valid species were described, bringing the total number of *Pachyneurium* species to 33. The species included by Engler, but not by Schott, in the present concept of sect. *Pachyneurium* were as follows (in the order presented in the revision):

A. pendulifolium N. E. Br.
A. paraguayense Engl.
A. joseanum Engl. (= *A. protensum* Schott)
A. jenmanii Engl.
A. uleanum Engl.
A. tarapotense Engl.
A. cubense Engl.
A. leonianum Sodiro
A. acutifolium Engl.
A. latissimum Engl.
A. barclayanum Engl.
A. ernestii Engl.
A. salviniae Hemsley
A. lindmanianum Engl.
A. martianum K. Koch & Kolb
A. selloum K. Koch
A. pallatangense Engl.
A. linguifolium Engl.

Until recent times, relatively few taxa of *Pachyneurium* had been described subsequent to Engler's revision. A list of the names published subsequent to Engler's time and prior to the beginning of this work is presented here:

A. agoyanense Sodiro = *A. dombeyanum* Brongn. ex Schott
  var. *agoyanense* (1905) = *A. dombeyanum* Brongn.
  var. *eleutheroneuron* Sodiro (1905) = *A. dombeyanum* Brongn.
A. angustilaminatum Engl.
  var. *albidum* Sodiro (1906) = *A. angustilaminatum* Engl.
  var. *brevipes* Sodiro (1906) = *A. angustilaminatum* Engl.
  var. *crassum* Sodiro (1906) = *A. angustilaminatum* Engl.
  var. *gladiatum* Sodiro (1906) = *A. angustilaminatum* Engl.
A. atropurpureum R. Schultes & Maguire
  var. *atropurpureum* (1953)
  var. *apertum* R. Schultes (1954) = *A. bonplandii* R. Schultes & Maguire subsp. *bonplandii*
A. bonplandii Bunting (1975)
A. concolor K. Krause (1932)
A. fasciale Sodiro (1905)
A. giganteum Matuda (1950) = *A. salviniae* Hemsley
A. guayanum Bunting (1975) = *A. bonplandii* Bunting subsp. *guayanum* (Bunting) Croat
A. lanjouwii Jonker & Jonker (1966)
A. maguirei A. Hawkes (1948)
A. ottonis K. Krause (1932)
A. rodrigoi A. Hawkes (1948) = *A. paraguayense* Engl.
A. superbum Madison (1978)
A. tessmannii K. Krause (1932) = *A. uleanum* Engl.
A. wurdackii Bunting (1975)

Of the 21 names listed above, 10 still represent valid taxa, while the remainder have here been synonymized. This raises to 46 the number of taxa of sect. *Pachyneurium* at the time this researcher began working with the Araceae (in approximately 1976). Subsequent to 1976, an additional 16 species of sect. *Pachyneurium* have been described. In "The Genus *Anthurium* (Araceae) in Costa Rica," Croat & R. A. Baker (1979) described six additional species: *A. brenesii*, *A. prolatum*, *A. schottianum*, *A. seibertii*, *A. standleyi*, and *A. upalaense*. Two more species were described in preparation for a revision of *Anthurium* for Panama, namely *A. luteynii* and *A. purpureospathum* (Croat, 1981); two species, *A. halmoorei* and *A. salvadorense*, were described in "A Revision of the genus *Anthurium* for Mexico and Middle America" (Croat, 1983) and two more, *A. nervatum* and *A. pseudospectabile*, were described in "A Revision of the *Anthurium* of Panama" (Croat, 1986). In addition, a number of Venezuelan species have been described by Bunting (1986, 1988, 1989) since this project began. These include *A. xanthoneurum* and *A. quanchezii* (1986), *A. vinillense* (1988, along with three others introduced into synonymy), and *A. iramirezae* (1989). Finally, one species, *A. plowmanii*, was described during the preparation of the treatment of the Araceae for the "Flora de Paraguay" (Croat, 1987). The current work includes a total of 114 species, representing 126 taxa, 48 of those being described for the first time. This is 147% more species than were recognized at the outset of the work.

SECTIONAL RELATIONSHIPS WITHIN *ANTHURIUM*

Section *Pachyneurium* is one of 18 sections recognized by Engler (1905). While Schott (1860) recognized 28 groups (and this probably will prove to be closer than Engler to the actual number of needed sections in *Anthurium*), he was dealing with only a small percentage of the species known to Engler. Engler no doubt found it necessary to broaden the concepts of the subgeneric groups in order to include all the new species. In doing so, some groups lost definition. This is particularly true in the case of the species he placed in sections *Belolonchium*, *Urospadix*, *Polyphyllium*, and *Xialophyllium*, all of which (and especially the first) contain what appears to be a wide variety of seemingly unrelated species. A discussion of these groups, their typification, and proposals for some realignment will be the topic of a future paper.

Section *Pachyneurium* is distinct in its ecological requirements and is the most edaphically adapted of all the sections to xeric growing conditions. Because of this, the taxa in the section are most prevalent in areas where there is a pronounced dry season, especially in areas of tropical moist forest. While species in sect. *Pachyneurium* occur in most life zones, most occur in tropical dry, premontane dry, and tropical moist forest. Relatively few species occur in tropical wet, premontane wet, or montane wet forest life zones. No *Pachyneurium* species is known from pluvial tropical forest.

In habit, especially in terms of their short stems, short, densely rooted internodes and mostly erect leaves held in a tight rosette, *Pachyneurium* species resemble most closely species of sect. *Porphyrochitonium*. Indeed, some members of that section, for example *Anthurium hacumense* Engl. (placed in sect. *Pachyneurium* by Engler), are often confused with *Pachyneurium* (Fig. 5). Still, species of *Porphyrochitonium* differ by having dark glandular punctations on one or both leaf surfaces, and in having convolute, not involute, vernation and berries which are often depressed apically with two or more seeds per locule. In addition, sect. *Porphyrochitonium* is ecologically very different, inhabiting some of the wettest life zones such as pluvial rainforest. The Chocó region of Colombia, for example, which is one of the wettest places on earth with more than 500 inches (2,272 mm) of rainfall per year, is the center of diversity for sect. *Porphyrochitonium*. Possibly also a member of sect. *Porphyrochitonium* is *Anthurium hookeri* Kunth, which resembles sect. *Pachyneurium* more than any other non-*Pachyneurium* (Fig. 6). It differs from typical *Porphyrochitonium* in being much larger and in having scalariform secondary lateral veins and perhaps belongs in a section of its own.

Much more easily confused with sect. *Pachyneurium* than sect. *Porphyrochitonium* is a relatively small group of species which also has the "bird's-nest" habit and shares similar oblong to oblanceolate or obovate leaf blades, but without involute vernation (a feature considered an absolute requirement regardless of habit or blade shape). Typical of this group is *A. michelii* Guill. (Fig. 3), once considered to be a member of *Pachyneurium* (Croat, 1983). These species, with epunctate, oblanceolate to oblong-elliptic blades and generally short stems with short internodes are mostly small plants not easily confused with typical *Pachyneurium* species, but some of the larger ones, such as *A. michelii*, are in fact easily confused with *Pachyneurium*. This group of plants has not been placed with certainty in any group, though it is tentatively placed in a new section including *A. decurrens* Poeppig, placed by Schott (1860) in his grex *Oxycarpium*. Since only three species, *A. decurrens*

Poeppig, *A. oxycarpum* Poeppig, and *A. consobrinum* Schott were included in Schott's grex *Oxycarpium*, and since the two latter species are now placed in sect. *Pachyneurium* (along with the epithet sect. *Oxycarpium*, which is now synonymous with sect. *Pachyneurium*) only *A. decurrens* remains. The name for this new section will be proposed in a future paper. This new section is the only section (other than sect. *Urospadix*) with short internodes and elongate, epunctate leaf blades with convolute vernation. Section *Urospadix* is, I believe, distinct from the latter section based on generally closer, more uniform primary lateral veins and its more restricted geographical distribution, mostly in southeastern Brazil.

Section *Urospadix* (Fig. 4) is the next most likely group to be confused with *Pachyneurium*. These two are probably not closely related owing to their lack of involute vernation (although one probable species of sect. *Urospadix* has hybridized with a *Pachyneurium*—see section on breeding behavior). Given that this character state, a conservative ontogenetic feature, is present only in sect. *Pachyneurium* and in only one other genus in the family, *Lagenandra*, it seems apparent that sect. *Pachyneurium* has no close relatives. Nevertheless, sect. *Urospadix* has many features in common with *Pachyneurium*, especially the short stems, close internodes, frequently rosulate habit and the presence of elongate, often short-petiolate leaf blades. In gross morphology they differ from members of series *Pachyneurium* in their generally closely spaced and moderately obscure primary lateral veins. Some members of sect. *Urospadix* are very similar to members of series *Multinervia*, a group mostly restricted to the Ecuadorian Andes. From species of series *Multinervia* they differ principally in having supervolute vernation, and in being geographically isolated in the geologically more ancient parts of eastern South America, namely Brazil. Section *Urospadix* ranges principally from the state of Bahia to São Paulo with at least two outlying species (tentatively placed in this section), one in the Venezuelan highlands (*A. yutajense* Bunting) and one from the Cordillera de la Costa (*A. lilacinum* Bunting).

Some other groups of *Anthurium*, especially species currently placed in sect. *Belolonchium* in Central America and in the West Indies, have species that are similar to those few species of *Pachyneurium* with cordate or subcordate blades, e.g., *A. venosum*, *A. ranchoanum*, *A. schottianum*, *A. standleyi*, *A. colonicum*, and *A. cotobrusii*. It is believed that this latter group of *Pachyneurium* has independently evolved the cordate condition rather than having independently acquired involute vernation. The reasoning here is that leaf vernation is a conservative ontogenetic character whereas leaf blade shape in the genus is a highly plastic one. Indeed, leaf shape may be highly variable even on individual plants (see section on leaf blades under Morphology).

The Central American species of *Anthurium* are now well known, and all suspected species have been screened for the presence or absence of involute vernation. Despite the fact that the endemic South American *Pachyneurium* species are less well known, many cordate South American species have been studied in cultivation, and no *Pachyneurium* species have been found among them. Thus the phenomenon of subcordate- or cordate-leaved *Pachyneurium* seems to be largely a Central American and West Indian one. It is in these regions where some cordate *Anthurium* species with short stems, short internodes and blades with free-ending veins (a relatively common feature in many cordate-leaved *Anthurium*) might be confused with sect. *Pachyneurium*. Engler placed a number of these species in his sect. *Pachyneurium* (Appendix 2). These included *A. longispathum* Carrière (= *A. grandifolium*), *A. grandifolium* (Jacq.) Kunth, *A. boucheanum* K. Koch (= *A. cartilagineum* (Desf.) Kunth), *A. liebmannii* Schott (= *A. umbrosum* Liebm.), *A. umbrosum* Liebm., *A. cordatum* (Willd.) G. Don, *A. andicola* Liebm., *A. cartilagineum* (Desf.) Kunth, *A. brownii* Masters, *A. appunianum* Schott (= *A. cartilagineum*), and *A. seleri* Engl. Except for *A. seleri*, most have many of the general features of sect. *Pachyneurium* and are in many ways similar to Central American and West Indies cordate-leaved species of *Pachyneurium*, except that they lack involute vernation. Thus, it is not surprising that Engler, apparently unaware of the important character of involute vs. supervolute vernation, placed these species in sect. *Pachyneurium*. On the other hand, using general characters such as leaf shape, short stems, and short internodes alone, many additional species from the West Indies, Central and South America might well have been placed by him in sect. *Pachyneurium*.

In general, South American species are either not subcordate-leaved, or their blades are decidedly elongate with merely the bases being subcordate (e.g., *A. fendleri*).

The remaining sections of *Anthurium* are not at all similar to members of *Pachyneurium* and need not be discussed.

MORPHOLOGY OF VEGETATIVE STRUCTURES

GROWTH PATTERNS

The shoot organization of *Anthurium* sect. *Pachyneurium* has been characterized by Ray (1986, 1987, 1988). Though appearing unbranched, the stems of most anthuriums are in fact highly branched with a growth pattern described as triphyllous sympodial (Ray, 1988). Each article (or segment) of the shoot includes a sylleptic prophyll (P) and mesophyll (E) (both of which are cataphylls) as well as a sympodial leaf (S) (a foliage leaf) and a solitary, terminal inflorescence (I). Vegetative buds are formed only on the sympodial segment and on the peduncle base (which is axillary to the mesophyll and the foliage leaf). This growth pattern can be summarized as follows (after Ray, loc. cit.).

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″
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{P – E – S – I}
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Studies by Tom Ray (pers. comm.) have defined the shoot organizations and growth patterns. In this regard sect. *Pachyneurium* is identical to that of all species of *Anthurium* with the exception of sect. *Polyphyllium*. It is the sylleptic prophyll which is termed the cataphyll throughout this work and previous works by this author on *Anthurium* (Croat, 1983, 1986). The stem thus consists of a series of units (articles), each of which comprises a branch with a single foliage leaf subtending (eventually) a continuation shoot and a terminal inflorescence.

STEMS

The stems of *Anthurium* sect. *Pachyneurium* are characterized primarily by being generally short and densely rooted. While most members of other sections of *Anthurium* (excluding *Xialophyllium* and *Tetraspermium*) have short to moderately short internodes as well, few sections ever have species with such extremely short internodes. Typically, those of sect. *Pachyneurium* are several times broader than long. Moreover, the caudex differs in being much more densely rooted than in other sections. Depending on the size of the stem and especially the size of the petiole bases, the stem diameter is highly irregular from node to node with the petiole bases conspicuously swollen while the very narrow intervening areas between them are devoted entirely to cataphylls and roots. The abscission scar of the petiole is generally broader than high (i.e., broadest laterally, perpendicular to the axis), though the shapes of the scars are usually not as variable throughout the section as is the range of variation of petiole cross sections. Petiole abscission scars are generally rounded abaxially and broadly rounded adaxially. The abscission scar is typically inclined inward to the axis at an angle of 110–140° from the axis of the stem. Unlike many *Anthurium* species with longer internodes, *Pachyneurium* has leaf scars that are usually not easily visible but remain obscured by the persistent cataphyll fibers and roots (Fig. 7).

The stems of *Pachyneurium* are generally short, usually less than 20 cm long, and rarely more than 30 cm long except in very large old plants. Stem diameter varies from as little as 1.5 cm in some of the smaller species to about 7 cm diam. in the larger species, generally averaging 3–4 cm diam. Stem diameter is in part also a matter of age, but mostly increases only slightly during the life of the plant.

Usually the oldest part of the stem rots away except for that portion contained in the living root mass. Older parts of the stem are frequently attacked by root borers, which enter through the softer central portion of the stem and bore up into the younger portions. However, perhaps because of the seasonally dry habitats and the generally massive root ball, which provides protection to the stem, sect. *Pachyneurium* exhibits fewer cases of infestation by root borers than perhaps any other section of *Anthurium*.

Only rarely do *Pachyneurium* species have noticeably elongate internodes. Some species, such as *A. consobrinum*, tend to grow rapidly when young, producing internodes to several centimeters long, before reverting to a slower growth with short, broad internodes. Some species may revert to a growth pattern with slightly longer internodes when disturbed or dislodged from their positions in trees, especially when they land on their sides or land upside down. This reversion to longer internodes, so common in other genera and even in other sections of *Anthurium*, is not common in *Pachyneurium*, and even when reversion to production of longer internodes does occur, the duration of long internode production is always very brief.

Of the two series of *Pachyneurium*, series *Mul-*

tinervia has a stronger tendency to produce longer internodes. This no doubt owes to their generally more mesic habitats at higher elevations, where the closer, more compact stems have less advantage (and perhaps some disadvantage since the more typical plants in series *Pachyneurium* would probably become waterlogged and rot in such cooler, wetter environments).

Pachyneurium stems are tough and moderately inflexible, perhaps owing to the presence of numerous coarse fibers. Only the central or older parts of the stem are soft, offering one of the few avenues for predation (the other being through the soft area of the abscission scar where the old peduncles have rotted away).

Pachyneurium stems are typically erect, whether habit is terrestrial or epiphytic. In a few rare cases stems may be repent, e.g., in *A. lindmanianum*. This is presumably an ecological adaptation, providing the plant with a better means of survival. *Anthurium lindmanianum* usually occurs in seasonally dry areas as a terrestrial plant along the edges of watercourses. In cultivation, the species will grow well in a standing pool of water on rocks or bricks above the water level. Its roots extend into the water and the typical rosulate habit is still maintained because the petioles are turned sharply at right angles to the stem and are held erect.

Despite the obvious ecological advantage of repent stems in drier areas, this habit has not evolved frequently in *Pachyneurium*. More commonly, even in extremely dry habitats, the stem and leaves are stiffly erect.

Stems may be horizontal to almost pendent in *A. pseudospectabile*, which grows suspended from a few roots. Potted plants of this species may grow in a curve until the apex is again directed more or less downward.

ROOTS

Perhaps more than any other section, *Pachyneurium* shows considerable variability in root disposition. Depending on the habitat and the species, some species, especially short-petiolate ones, may produce most of their roots so that they are directed upward or downward or spreading. Typically, in epiphytic species in mesic habitats that experience a pronounced dry season, at least the uppermost roots are directed upward and are frequently narrowed and pointed at the ends as well (Fig. 8). This provides a clear advantage for collecting falling debris and precipitation around the roots (Figs. 7, 13). These uppermost roots frequently even grow into the basket often formed by the rosulate habit and the short-petiolate leaves (Figs. 7, 8, 14). The uppermost roots are the most active in terms of growth, and generally act as feeder roots.

Even in such situations, still other roots, usually those further down on the stem, act more for anchorage and support. These are also generally longer, stouter, and less well ordered, being instead more frequently intertwined. They are nevertheless equally capable of entrapping debris and are, at least near the periphery of the living root mass, debris-infested. Because long-petiolate species are less likely to be efficient at catching debris, they are more likely to have their roots directed downward rather than upward (Fig. 9).

The root masses of most species are extremely compact, the roots generally being completely contiguous with one another near the surface of the stem in most species of series *Pachyneurium* (Fig. 10). Some species, especially many members of series *Multinervia*, have less densely aggregated roots. This compact nature of the root system not only enables the plant to adapt well to dry conditions, allowing it to absorb quickly virtually all of the rainwater that passes through in brief rain showers, but also is effective in keeping phytophagous insects, especially root borers, away from the stem.

Other *Pachyneurium* species, especially the terrestrial ones, frequently have their roots directed downward along the stem and into the ground. These species, despite the fact that they too often have the typical rosulate habit with short stems, are frequently growing under conditions where they are less likely to accumulate debris from falling leaves, etc., and often grow out in the open or under low forest, which does not yield such high quantities of debris. Some terrestrial species, such as *A. atropurpureum* var. *atropurpureum*, *A. pachylaminum*, or *A. bonplandii*, often occur on white sand soils, which are notoriously poor in nutrients, and are either found growing in open areas or growing beneath typically evergreen trees on white sand soils. In such situations, roots directed into the soil appear to be an adaptation to take better advantage of nutrients present in the soil, which might not be available from accumulated debris. On some species, e.g., *A. linguifolium*, from a very arid area, the uppermost feeder roots are much reduced and directed upward rather than downard.

The roots themselves, usually 3–8 mm diam., are initially covered with a dense layer of root hairs, so dense as to appear as a smooth and continuous layer. Artificial drying of the stems, which causes a shrinkage of the roots and root hairs, reveals their true nature, wherein the roots generally appear woolly-pubescent. At least one exception to the typically smooth roots on fresh plants is seen in *A. johnsoniae*, which has fresh roots with a somewhat irregular warty surface.

In addition to obvious functional differences, the roots have taxonomic importance, especially the color, thickness, degree of spreading, and length of the uppermost feeding roots.

CATAPHYLLS

The cataphyll is a modified leaf that protects the newly emerging leaf. It is termed the sylleptic prophyll by Ray (1986, 1987, 1988). Once the leaf emerges, the cataphyll has no functional significance in remaining photosynthetic (for ecological significance see below) and promptly dries up. Though the cataphylls of *Anthurium* do not contribute as many useful characters as do those of *Philodendron*, the cataphyll in sect. *Pachyneurium* is more diverse than in any other section of *Anthurium*. There are two basic types of cataphylls, with one type subdivided:

(1) cucullate (hood-shaped) (Figs. 15, 46)
(2) narrowly triangular or lanceolate
    (a) straight (Fig. 11)
    (b) hook-shaped (Fig. 16).

The former type is rare, known for certain only in *A. salviniae* and *A. barclayanum*. It is interesting to note that the cucullate cataphylls (and sometimes also hook-shaped cataphylls, e.g., *A. loretense*) also have leaves which are circinate in bud in addition to having involute vernation (Fig. 17). Upon unrolling, the young leaf first unrolls lengthwise, then unrolls toward both margins in the usual manner of sect. *Pachyneurium*.

The second cataphyll type, narrowly triangular or lanceolate, is overwhelmingly more common, and most of these are straight and erect. In South America some species have narrowly triangular cataphylls that are hooked (the phenomenon is absent among Central American species). Plants with typically hook-shaped cataphylls also have sharply D-shaped petioles in cross section (Fig. 16). Blades emerge in the same fashion in both types of narrowly triangular cataphylls, but the hook-shaped type are usually smaller than the straight ones and thus the emerging leaf is usually smaller before expansion. Nevertheless, the overall size of the fully expanded leaf blade does not seem to correlate with the size of the newly emergent but unfolded leaf blade, since some species with hook-shaped cataphylls have among the largest leaves in the section, e.g., *A. loretense*.

Fresh cataphylls of *Anthurium* are uniformly green (unlike *Philodendron*, where they may be colorful), and except for length and shape they are monotonously similar. Moreover, the cataphylls dry promptly after the emergence of each new leaf and thus usually no more than one fresh cataphyll is visible. The old, dried cataphylls are more significant taxonomically, perhaps more characteristic than those of other sections of the genus. Although some species, e.g., *A. eximium*, *A. luteynii*, *A. upalaense*, and *A. willifordii* have cataphylls that dry persistent and intact, most persist in a weathered state (Fig. 12). The degree to which weathering takes place varies substantially. While some weather to disorganized and inconspicuous fibers that are mostly obscured by the roots and petiole bases (Fig. 14), other species, especially those with longer cataphylls, dry with their fibers in an organized or semiorganized intact fashion, e.g., *A. luteynii* (Fig. 18) and *A. pendulifolium* (Fig. 9); others dry intact, and then quickly weather to fibers (Fig. 19). In addition to the length of the cataphyll, which may vary from 3 to 40 cm, there are differences of color and thickness, which are taxonomically significant. Unfortunately, like many other characters in *Pachyneurium*, these differences are difficult to quantify as key characters.

Though of minor importance taxonomically, cataphylls have an important function ecologically. They generally weather into fibers which, in conjunction with the roots, aid in entrapping debris.

LEAVES

Petioles. The petioles of sect. *Pachyneurium* are typically much shorter than the blades and this, coupled with the short internodes, provides the basic ingredient for the rosulate habit and "bird's-nest" appearance. Some species of *Pachyneurium*, even the more typical members of series *Pachyneurium*, may have long petioles, but they are less effective as debris catchers and even tend to have leaves spreading laterally, e.g., *A. llewelynii*, or pendent, e.g., *A. pendulifolium*, *A. pseudospectabile*, and *A. spectabile*.

Petiole cross-sectional shapes of sect. *Pachyneurium* are diverse, perhaps more so than in any other section of *Anthurium*. *Pachyneurium* species have at least some of the cross-sectional shapes in each category from A through E (Fig. 21). Cross-sectional shapes in *Pachyneurium* are mostly "D-shaped" (category B), "markedly angular" (D) and "markedly ribbed adaxially" (E) with fewer species having petiole cross sections in category A, "terete." The U-shaped cross-sectional shape is rare in sect. *Pachyneurium*. Many species of *Pachyneurium* have C-shaped petioles (A 6–8), and petiole shapes that are more or less trapezoidal to D-shaped with prominent abaxial ribs are especially common (E 1–3).

The petiole base is usually briefly sheathed (Figs. 14, 16) and encircles the inflorescence (the latter may abort). The sheath is usually inconspicuous and short, only rarely extending up to as much as 8 cm long. In most cases the sheath is restricted to a very small percentage of the total length of the petiole but may, for example in *A. consobrinum*, *A. fatoense*, and *A. harlingianum*, have sheaths that extend almost to the base of the blade. The petiole in all *Pachyneurium* species terminates in a conspicuously swollen geniculum, which facilitates leaf blade orientation.

Blades. Vernation—The nature of the developing blade is highly significant taxonomically, especially at the sectional level in the case of sect. *Pachyneurium*. *Anthurium* sect. *Pachyneurium* is the only section of *Anthurium* known to have involute vernation of the developing leaf blades. Indeed, only one other genus in the Araceae, *Lagenandra* from the Old World Tropics, has involute vernation. With involute vernation the developing leaf (in bud) has both margins of the blade rolled inward toward the midrib (Fig. 1), whereas supervolute vernation, the common type of vernation for *Anthurium*, has one margin rolled inwardly to the midrib and the other rolled around the coiled up inner blade margin, as well as the midrib (Fig. 2).

Although the presence of involute vernation is consistent on adult plants, juvenile plants of *Pachyneurium* species may have supervolute vernation or a transitional stage of development where only a part of a leaf blade (usually the widest part) has involute vernation. Richard Sheffer (pers. comm.) reports observing a series of leaves from a single plant where the vernation of successive blades progresses gradually from wholly supervolute blades when juvenile, to partially involute blades to wholly involute blades in adult plants. In series *Multinervia*, which has in general more slender blades, the tip of the blade is frequently supervolute while the remainder of the blade has typical involute vernation. This failure of the apical portion to be involute is probably due to the difficulty in rolling up an increasingly narrower section of leaf tissue.

General features—Although species in sect. *Pachyneurium* typically have thick, oblanceolate to obovate leaf blades with short petioles, the group is actually quite variable in blade shape with blades ranging from linear-oblong to ovate-triangular to ovate, with bases acute to subcordate or cordate. The less typical species, such as *A. schottianum*, *A. standleyi*, and *A. watermaliense*, have moderately thin blades with distinct posterior lobes. Typically, blades are more or less elongate, broadest at or above the middle of the blade and gradually tapered to the base, but frequently the blade ends abruptly and is often rounded at the base or even subcordate (e.g., *A. fendleri*) despite its generally oblanceolate or obovate overall shape. Leaf blades may be quite variable at the base, even on the same plant varying from shallowly cordate to acute (Fig. 20).

While the blade of most *Pachneurium* species extends to the base of the midrib and ends immediately above the geniculum of the petiole, some species have a large section of the midrib completely naked, so that it appears to be a part of the petiole proper. This is perhaps most extreme in *A. oerstedianum*, but other species, such as *A. guanchezii*, *A. pranceanum*, and *A. remotigeniculatum*, also display this feature. While this feature exhibits some taxonomic value, it does not always represent a character warranting specific recognition. This is true, for example, in *A. bonplandii* subsp. *bonplandii*, which sometimes has the geniculum appearing remote for a few centimeters, but does not otherwise appear to be different from other plants of the taxon (see *Schultes & Cabrera 14083*). Venation is relatively uniform considering the wide range of blade shapes. Usually the major veins are prominently raised on both surfaces, with the midrib varying from slightly convex to angular above and typically more prominently convex below. Frequently, if the midrib is angular above, this is owing to a continuation of a medial rib on the adaxial surface of the petiole, but more commonly the midrib is flat at the very base on the adaxial surface. From this point the midrib may become progressively more raised and more acute toward the apex, the most acute portion being in the distal 2/3 of the blade. From this point the midrib commonly becomes diminished and is usually even weakly sunken at the very tip. This is generally true also when the midrib on the adaxial surface is merely rounded or obtuse rather than acutely raised.

On the lower surface, the midrib may be convex or angular, but when it is angular it is usually due to an extention of the ribs onto the petiole. In this case, the ribbing on the abaxial surface of the petiole is often present on the geniculum as well, e.g., in *A. luteynii*.

For typical members of sect. *Pachyneurium* (always true for series *Pachyneurium*), the primary lateral veins are prominently raised on both surfaces (hence the sectional name), most commonly departing from the midrib at 30–55° in the middle of the blade and sometimes at broader angles, approaching 90° near the base of the blade. Rarely, as in *A. reflexinervium*, *A. paraguayense* var. *coroicoanum* and *A. latissimum*, the veins may arise at an angle of 90° or more near the base of the blade and the primary lateral veins may actually be retrorse in such cases.

Blades with rounded, cordate or subcordate bases tend to have an aggregation of veins at or very near the base of the blade. For those species with rounded or subcordate bases, all but the lowermost are considered primary lateral veins, whereas those species with cordate bases generally have a series of basal veins (as defined in Croat & Bunting, 1979). These basal veins in all species with well developed posterior lobes are generally directed downward into the lobes and may be in part united into a collective vein (Croat & Bunting, 1979).

Pachyneurium species rarely have interprimary veins or secondary veins (i.e., major branches off of the primary lateral veins), both of which are often well developed in other sections of *Anthurium*. Tertiary veins on the other hand are usually well developed, and reticulate veins are often well developed and conspicuous at least after drying. In some species, most notably *A. crenatum*, the reticulate veins are quite conspicuous even on fresh leaves. The largest tertiary veins are generally very conspicuous in most species and are generally weakly raised on the lower surface and moderately obscure on the upper surface. However, some species, such as *A. jenmanii*, *A. bonplandii*, and *A. atropurpureum*, have many of the tertiary veins sunken or etched into the upper surface on fresh leaves.

Blade margins of most *Pachyneurium* are entire (though somewhat sinuate in *A. barclayanum* and *A. paraguayense*) and may be flat to markedly undulate, such as in *A. affine*. Typically, blades are cuneate (gradually and evenly narrowed toward the base so that the margin in the lower part of the blade is straight). However, in some cases, e.g., *A. latissimum*, *A. palenquense*, *A. remotigeniculatum*, the blades are attenuate with concave basal margins.

Features on blade surfaces are noticeably absent in most species, though many of the species in the Amazon basin, especially those occurring in areas where white sand soils predominate, frequently exhibit raised pustules. Some species, notably *A. bonplandii*, have weakly raised plate-shaped, glandlike structures which may be darker than the surface and visible to the naked eye. These are especially conspicuous on *A. bonplandii* subsp. *guayanum* and *A. xanthoneurum*. Rarely, blades may be glaucous on the lower surface as is sometimes the case in *A. caucavallense* and *A. glaucospadix*, but even in these species not all plants possess glaucous blades.

MORPHOLOGY OF REPRODUCTIVE STRUCTURES

INFLORESCENCES

As in other *Anthurium* sections, members of sect. *Pachyneurium* have a single inflorescence per leaf axil arising from the sheath. Commonly, the inflorescence emerges fairly promptly from the leaf axil, requiring one to six weeks to fully emerge. Although every leaf axil has the potential to produce an inflorescence, the inflorescence may abort, and usually does so before the plant reaches a certain age. Usually, the inflorescences emerge one at a time from the axils of the uppermost leaves (but rarely from the youngest, i.e., most recently emerged leaf). In this manner a plant may have several inflorescences present, but rarely as many as four per plant. Usually a plant has one or two inflorescences, each in a different stage of development. The rate of the emergence of the inflorescences usually precludes the possibility of self-pollination because they do not reach anthesis at the same time (see section on Flowering Behavior). In unusual cases, the inflorescences may emerge from several leaf axils within a short span of time, e.g., in *A. schottianum*. In this case the inflorescences are still not of the same age, but they are more nearly alike in age than is normally the case. This also has an important bearing on the phenology, since this species tends to flower in short, brief bursts rather than periodically throughout the year (see section on Phenology).

Peduncles. Peduncle length in *Pachyneurium* is highly variable even within the same species and at different phases of an individual plant's life. Nevertheless, the petiole–peduncle length ratios are often highly significant taxonomically, at least at anthesis. The peduncle is generally terete and green, or occasionally with an acute angle on one side of the peduncle which extends along much of its length, or rarely with several ribs around the circumference of the peduncle. Most species have peduncles that vary from somewhat longer to several times longer than the petioles, and only rarely is the peduncle shorter than the petioles (e.g., *A. curtispadix*, *A. plowmanii*, and sometimes *A. ernestii* and *A. purpureospathum*). Typically, the peduncle is moderately stiff and is held erect or semierect at least during anthesis. After anthesis, the peduncle either begins to turn yellow and shrivel, in the event that pollination has not occurred, or it becomes heavier with the development of fruits and the weight of the resulting infructescence causes the peduncle to bend outward or even downward.

A few species, such as *A. cataniapoense*, *A. salviniae*, *A. pendulifolium*, and often *A. solitarium*, have long, slender peduncles with the inflorescences pendent at anthesis. Regardless of whether the peduncle is thick, stiff, and erect or slender and pendent, it becomes thicker in the fruiting stage to compensate for the added weight of the berries. The net weight of the inflorescences may increase during maturation by a factor of 20 or more. Because of the heavy weight of the infructescence, very few species, even those with erect inflorescences, bear their fruits in an erect position. Among those that do are: *A. cubense*, *A. plowmanii*, *A. purpureospathum*, and *A. superbum*, all of which have very short peduncles.

Spathes. Although sect. *Pachyneurium* has spathes that are not so typically colorful or as taxonomically useful as in other sections of *Anthurium*, especially sect. *Calomystrium*, the spathe still carries considerable taxonomic weight in the recognition of species. The typical spathe of *Anthurium* sect. *Pachyneurium* is oblong-lanceolate, acuminate at the apex and with the distal margins often slightly inrolled. Typically, the spathe is inserted at about a 45° angle on the peduncle. The base is generally acute to attenuate and is often decurrent onto the peduncle for a short distance. Usually somewhat coriaceous or subcoriaceous, the spathe completely envelops the spadix only when the latter is very young. The spathe is generally loosened and free from the spadix before the pistils of the flowers are visible. Ordinarily, the spathe is initially erect for a time after it opens, the natural result of its erect position while in bud, but in most cases the spathe soon spreads and may ultimately be erect-spreading or spreading, or it may become spreading-reflexed to reflexed and even caducous (e.g., *A. fendleri*). These spathe positions are not always taxonomically significant, and a single spathe may go through a series of positions throughout the course of its development. Still, many species have spathes that are characteristically positioned in a particular manner, usually comprising no more than two of the above positions for one taxon. The spathes of *A. bradeanum*, *A. sarukhanianum*, and *A. salvadorense* remain erect and may enshroud the spadix in the two latter species.

The spathe is usually curved along most of its length after spreading so that, strictly speaking, no directly measureable angle is formed with respect to the peduncle. In addition, the spathe may be variously undulate, inrolled, or twisted. In some cases this feature may be extreme, e.g., in *A. colonicum*, *A. pseudospectabile*, and *A. spectabile*, where the spathe becomes very much contorted.

While the spathes of *Pachyneurium* are typically thick and persistent, some species, mentioned above, have thin spathes which begin withering almost from the moment they open, and generally wither off and fall free in time. Even in some species with typically thicker spathes, such as *A. jenmanii*, the spathe withers, or at least yellows, shortly after anthesis. In these cases the spathe, though withered, usually does not fall free, but remains on the spadix in its withered state.

Spathes are generally about as long as the spadix but may be substantially shorter at anthesis or even longer than the spadix as in the case of *A. eximium*, *A. galactospadix*, and *A. spathiphyllum*. While the absolute lengths of the spathe and spadix are variable throughout the course of a plant's development and are thus usually not so valuable as key characters, the relative length of the spathe in relation to the length of the spadix may provide a useful character, especially when studied at anthesis. The proportional differences in the size of both the spathe and spadix during their development need not remain constant. For example, the spathe does not greatly elongate after anthesis for some species, such as *A. fendleri*, whereas the spathe of *A. salviniae* increases in length after anthesis.

Spadices. The spadix shape of *Anthurium* can vary from long-tapered to oblong (Fig. 59) or spindle-shaped or even obovoid or subglobose. The spadix of most *Pachyneurium* species is typically short-tapered (Fig. 232) or long-tapered (Fig. 44). A few species, such as *A. cubense*, *A. superbum*, *A. bradeanum*, *A. affine*, and *A. spathiphyllum*, have spadices that are oblong-cylindric or clavate, while *A. sarukhanianum* has a narrowly obovoid spadix (Fig. 277). Spadix color, though variable, is not very useful for *Pachyneurium* because so many species have spadices that are green or purplish, with only a relative few being red (sometimes in *A. ernestii*), white (*A. superbum*), yellow, or other colors. In addition, spadices of some species (e.g., *A. barclayanum*) may vary from green to purplish. *Anthurium ernestii* is markedly variable according to herbarium labels, with spadices at least varying from pinkish to magenta to purple, dark red, or green. Overall spadix size in *Pachyneurium* is variable and depends on the size and age of the plant and its condition. As indicated above under "Peduncle," the relative length of the spadix compared to the peduncle may be important taxonomically. However, even this character is sometimes highly variable and may vary depending on the age and health of the plant.

Flowers are arranged in close spirals (Croat, 1980) with mostly more than five flowers visible per spiral from any angle. The number of flowers visible per spiral, though somewhat variable from spadix to spadix for any species, may also be taxonomically significant, with the number ranging from as few as 3 or 4 flowers visible per spiral for *A. vaupesianum* and *A. uleanum* var. *nanayense* to as high as 28 flowers visible per spiral for *A. galactospadix*, and 24 for *A. superbum*. Descriptions of the number of flowers per spiral refer always to the number of flowers visible from any angle rather than the number actually needed to make a complete spiral (the reason being that the reader could not easily interpret the number of flowers on a herbarium sheet).

As is true of all *Anthurium* species (Croat, loc. cit.), *Pachyneurium* flowers have four tepals, which are mostly hidden from view without dissection. They are arranged symmetrically on four sides of the pistil. Tepals are narrow, thin, and generally colorless except at the apex. Tepals are markedly cucullate at the apex and mostly cover the apex of the pistil. The apical portion of each tepal is more or less 3-sided, with the inner margin (that portion directed inward toward the stigma) thin and sometimes turned up against the pistil, especially when the pistil is exserted, as in *A. consobrinum*. "Tepal shape" when referred to throughout this work refers only to the apical, visible portion of the tepals. In the same way "flower shape" refers only to the apical portion of the flower. Flower "length" refers to the width of the apical portion of the flower in the longitudinal dimension of the spadix, while flower "width" refers to the width of the apical portion of the flower in the lateral dimension (i.e., perpendicular to the axis of the spadix). The actual length of the tepals, including the hidden portion which extends into the axis of the spadix, is never measured.

Tepal shape may be important taxonomically. Most are basically triangular, with the inner margin almost straight to rounded to broadly rounded. The outer margin, though commonly two-sided, is more variable. Some species, e.g., *A. barclayanum*, *A. curtispadix*, and *A. glaucospadix*, may have tepals which have the outer margin 3- or 4-sided. In the latter case the tepal may be referred to as "shield-shaped."

Androecium. Like all *Anthurium*, sect. *Pachyneurium* has four stamens, each of which is affixed at the base of a tepal. Stamens are tightly compressed between the tepals and the pistil and are not visible without dissection prior to anthesis. The filament is slender (typically much narrower than the hidden portion of the tepal), conspicously flattened, and generally colorless and translucent or sometimes whitish. Fresh filaments are usually somewhat succulent with a thin epidermis. Shortly before maturity of an individual stamen, the anther is pushed out from between the tepal and the pistil by elongation of the filament. Once exposed, both thecae of the anthers promptly open by longitudinal slits. Dehiscence is extrorse. Thecae are generally more or less oblong or ovoid, and unlike some sections e.g., *Porphyrochitonium*, are generally only slightly divaricate (e.g., with the two thecae diverging away from one another toward the base). For further details of stamens see section on Flowering Behavior.

Gynoecium. Typical of other sections of *Anthurium*, the pistils of sect. *Pachyneurium* are bilocular, more or less oblong-ovoid, and are tightly compressed in between the four tepals. A well-defined style is always lacking. The pistils are visible only at the apex and sometimes are almost completely covered by the tepals. Generally, only the stigma is visible. Each locule contains a single ovule with axil placentation. For additional details of the gynoecium see section on Seeds.

Stigmas consist of an elongate slit (Croat, loc. cit.). Generally those of sect. *Pachyneurium* have the stigmatic hairs contained within the slit, densely covering both sides of the inner surface. Occasionally, e.g., *A. palenquense*, the stigmatic hairs may be long-exserted, forming a brushlike stigma. Stigmatic fluid is produced by the stigmas and generally accumulates to form conspicuous droplets. For additional details, see section on Flowering Behavior.

FLOWERING BEHAVIOR

Long-tapered spadices generally have flowers developing from the base of the inflorescence and progressing toward the apex. Those with oblong or narrowly obovoid spadices generally have the first flowers to reach anthesis at the middle or lower one-third of the inflorescence with development progressing toward both ends. For a review of flowering behavior of *Anthurium* see Croat (1980).

All other features of flowering behavior are identical to those described in that paper. Typically, *Pachyneurium* species have spadices at anthesis for long periods. While most species have spadices in anthesis for about a week, some, such as *A. luteynii*, may have spadices in anthesis for several weeks. As in other species of *Anthurium*, flowers are usually markedly protogynous, with the pistillate phase clearly separated from the staminate phase. During the pistillate phase most species in sect. *Pachyneurium* produce nectar droplets on the stigmas. Some species, such as *A. concolor*, may also produce droplets of nectar on the tepals as well. In natural situations these droplets are rarely allowed to accumulate, apparently being removed by pollinators, but in cultivation the droplets may accumulate to such an extent in some species, e.g., *A. upalaense*, *A. validifolium*, and especially *A. lutyenii*, that the nectar drips off the spadix (Fig. 332).

As in other species of *Anthurium*, the staminal development of *Pachyneurium* generally begins with the lateral stamens (Croat, 1980) followed by the alternate pair of stamens with the anterior stamen (referred to throughout this paper as the third stamen) developing before the posterior stamen (referred to throughout this paper as the fourth stamen). In most species of *Pachyneurium*, lateral stamens emerge well ahead of the first alternate stamen, varying from about 3 to 20 spirals ahead of the third stamen (usually the anterior stamen), and the first alternate stamen usually also emerges several spirals ahead of the fourth stamen. Thus, the available fresh pollen is commonly scattered over ⅓ or more of the spadix. When the stamens first emerge, the anther is frequently slightly exserted on a fleshy, thickened filament and is frequently colored. Anthers usually open promptly after emerging from beneath the tepals. Most frequently the pollen color is yellow, orange, or purplish, but is often white. The exserted anther lasts generally less than one day, and the anther is then generally retracted so that it is positioned at or near the level of the tepal (Croat, 1980). The retraction is caused by the loss of water in the thin filaments and the resulting shrinkage. Usually by the end of the first day of emergence of the stamens and always by the next day, the color of the pollen and generally that of the anther has faded (probably due to oxidation) and usually turns white. Some species, especially certain members of series *Multinervia* (e.g., *A. acutissimum*, *A. obscurinervium*, and *A. oxyphyllum*) have stamens that are prominently long-exserted and remain exserted after anthesis.

The fact that pollen has faded in color does not necessarily mean that it is not viable, but fresh pollen is most effective in pollination.

Generally, individual flowers of *Pachyneurium* species are so markedly protogynous that stigmatic droplets have dried up on all flowers by the time the stamens emerge on the lowermost flowers; however, in some cases the stigmatic droplets are present on the uppermost flowers of the spadix, and at the same time the stamens are beginning to emerge on the lowermost flowers of the spadix, thus geitongamy is possible. In fact, it is common practice for plant breeders to manipulate the spadix of a single inflorescence to attempt self-pollination when no other pollen is available. While not always successful, this method will sometimes work on some species.

MORPHOLOGY OF FRUITING STRUCTURES

INFRUCTESCENCES

The fruiting spadix of most species of sect. *Pachyneurium* is much expanded in size, the extra girth coming from both an expansion of the pithy axis of the spadix and a general increase in the length of the tepals. The expansion accommodates the greatly expanded size of the developing berry.

Berries. In most *Pachyneurium* species the berry begins to emerge above the tepals and becomes colored well in advance of its actual maturation, i.e., before the seeds are matured sufficiently to germinate. Alternatively, the enclosed seeds usually are capable of germination somewhat before the berry becomes fleshy, loose, and obviously mature. Berries are also capable of maturing to some extent even on severed inflorescences. This is important when collecting seeds before the berries are fully mature. The berries of the mature infructescence generally emerge in sect. *Pachyneurium* in a scattered fashion over a relatively long period of time, but some species, such as *A. spathiphyllum* and *A. consobrinum*, have fruits that emerge more nearly simultaneously. Typically, the berries are weakly exserted and do not fall free for display.

Berry shape is typically obovoid to obovoid-ellipsoid and generally rounded but sometimes acute to narrowly acute at the apex. Berry shape may be variable even within a single population, e.g., in *A. schlechtendalii*, where berries may be acute to rounded at the apex.

Berry color. Berries of sect. *Pachyneurium* are typically concolorous and are summarized in Tables 1–3. Exceptions, with bicolored berries, include:

(1) *Anthurium consobrinum*, with white fruits and red to purple apiculate tips; (2) *A. superbum*, with fruits colored lavender at the base and white at the tip; and (3) *A. pendulifolium* with fruits colored purplish lavender to reddish purple at base and white at the tip.

In general, fruit color (yellow, orange, red, or purple) remains distinct and permanent throughout their maturation. The purple-fruited species, however, are an exception and are much more variable in color during development. An example is *A. pendulifolium*, where pure lavender to reddish violet berries may become almost completely white at maturity. Included in the "purple" family, mentioned in detail in Table 1 are lavender, violet-purple, violet, purple, purplish violet, reddish violet, and maroon.

Berry color is not only of great taxonomic significance in terms of species recognition, but it is also important in defining relationships between different groups of species. Fruit colors by percentage are summarized in Table 3. In Central America and the West Indies, red, orange, or yellow fruits predominate, while in South America, purple to purplish fruits predominate (Tables 2, 3). For example, for species with known fruit color in Mexico and Central America (excluding Costa Rica), 84% have red, orange, or yellow fruits (fruit color is not yet known for *A. sarukhanianum*, but its apparent relatives have fruits in this color range). In Costa Rica and Panama, this percentage is even higher (88%). Of these colors, orange predominates in Panama and Costa Rica, with 60% of the total. The orange-fruited species are in many ways atypical, often having leaves with long petioles and cordate to truncate or rounded bases. The red-fruited species, on the other hand, are more typical, with tight rosulate habits, short petioles, and generally acute leaf bases. Fruit color is still unknown in two Costa Rican or Panamanian species, i.e., *A. spathiphyllum* and *A. oerstedianum*. While the former is probably white-fruited, it is difficult to predict the fruit color of *A. oerstedianum* as it is seemingly unrelated to anything else. Central America has only one species with purple fruits, *A. fendleri*, which is a northern South American species barely reaching Central America (rare, in Panama only).

In contrast to Central America, South America, especially the lowland Amazonian basin, is rich in purple-fruited species (or fruits with at least some purple present), with 94% of the total in this category. The eastern slopes of the Andes are almost as rich in purplish fruited species, with 90% of the total being purple or with some form of purple. The western slopes of the Andes have a significantly lower percentage of purplish fruits (60%). This is largely due to the presence in the central Andes of series *Multinervia*, which has a large percentage of its species having orange fruits. The western slope of the Andes is more diverse in fruit color than the eastern slope, with fruits in the orange, red, and purple color groups. In contrast, the eastern or Amazonian slope has only the red and purple-fruited color groups. Of these color groups, purple still remains the most predominant, with the red to orange group having only 10%.

With the exception of the western Andean slopes and the far northern region of South America, purple fruits predominate in all other South American geographical areas. A total of 75% of the species of the Amazon Highlands and eastern Brazil are purplish fruited, while the comparable figures for the Guiana Highlands and the Andean Highlands are 100%. On the other hand, for species restricted to far northern South America (defined here as species with a range that includes lowlands with a Caribbean drainage), only 33% are purplish fruited. Indeed, of all species occurring in far northern South America (including those red-fruited species entering from Central America, *A. concolor* and *A. salviniae*) and in the West Indies (*A. cubense*), only 27% are purplish fruited. The only orange-fruited species not occurring in the central Andes or Costa Rica–Panama, *A. johnsoniae*, occurs in this region.

If all species with known fruit color occurring anywhere in South America are considered (including *A. affine*, which is also reported as sometimes red-fruited), a total of 46 out of 62 (74%) have purplish colored fruits, 12% have red fruits, and only 8% have orange fruits. Comparable figures for all species with known fruit color for Central America are 3% purple fruits, 29% red fruits, and 48% orange fruits. While the separation between purple-fruited species and those with red or orange fruits seems very clear, it is less obvious that there is a strong separation between red- and orange-fruited species. Though red and orange would intrinsically appear to be closely related colors, fruits of species in these color groups are typically conspicuously orange or conspicuously red. However, there are exceptions with *A. cubense* and *A. carchiense*, both of which have berries orange-red, and *A. purpureospathum*, with berries reported orange to red-orange or red. Both *A. cubense* and *A. purpurpeospathum* otherwise appear to be close relatives of red-fruited species of series *Pachyneurium*, while *A. carchiense* is otherwise closely related to other orange-fruited mem-

TABLE 1. Fruits, sorted by color

LOC	Species	Primary color*	Second color
CRP	*consobrinum*	white	greenish white
SBR	*coriaceum*	grayish white	lavender
MCA	*nizandense*	greenish white	
CRP	*acutifolium*	greenish yellow	
CRP	*bradeanum*	greenish yellow	white
CRP	*fatoense*	greenish yellow	orange, pale
MCA	*halmoorei*	yellow	
WA	*acutissimum*	yellow-orange	orange
WA	*angustilaminatum*	orange?	
CRP	*brenesii*	orange	
CRP	*colonicum*	orange	
CRP	*cotobrusii*	orange	
WA	*holmnielsenii*	orange	
NSA	*johnsoniae*	orange	
CRP	*luteynii*	orange	
CRP	*nervatum*	orange	
WA	*oxyphyllum*	orange	
CRP	*prolatum*	orange?	
CRP	*protensum*	orange	
CRP	*pseudospectabile*	orange	
CRP	*purpureospathum*	orange	red-orange
CRP	*ranchoanum*	orange	
CRP	*seibertii*	orange	
CRP	*spectabile*	orange?	
CRP	*standleyi*	orange	
CRP	*validifolium*	orange	
WA	*carchiense*	orange-red	
WCS	*cubense*	orange-red	
MCA	*salvadorense*	orange-red	
CRP	*schottianum*	pinkish?	
CAR	*venosum*	red-orange	
PSA	*concolor*	red	
NSA	*crassinervium*	red	
CRP	*eximium*	red	
EA	*fasciale*	red	
LA	*plowmanii*	red	
CSA	*salviniae*	red	
MCA	*schlechtendalii*	red	
WA	*sparreorum*	red	
CRP	*upalaense*	red	
NSA	*anorianum*	red, dark	
CAR	*crenatum*	red, bright	
BH	*affine*	red	purple maroon
WA	*lennartii*	red	purple, dark
CSA	*wagenerianum*	red	purple
EA	*latissimum*	maroon	red-violet, deep
EA	*paraguayense* var. *paraguayense*	maroon	reddish
GH	*wurdackii*	maroon	
LA	*ernestii* var. *ernestii*	red-violet	violet
LA	*uleanum* var. *uleanum*	reddish violet	
AH	*glaucospadix*	reddish purple	
WSA	*jenmanii*	reddish purple, pale	
EA	*reflexinervium*	reddish violet	
WA	*napeaum*	burgundy	purplish violet
LA	*willifordii*	magenta	
LA	*superbum*	lavender	

TABLE 1. Continued.

LOC	Species	Primary color*	Second color
LA	*pendulifolium*	lavender to white	
LA	*bonplandii* subsp. *bonplandii*	purple	
EA	*llewelynii*	purple	
WA	*obscurinervium*	purple	
LA	*oxycarpum*	purple	red
WA	*pallatangense*	purple	
EA	*paraguayense* var. *coroicoanum*	purple	
WA	*simpsonii*	purple	
BH	*solitarium*	purple	
LA	*loretense*	purple violet	
LA	*atropurpureum* var. *atropurpureum*	purple, dark	red, deep
AH	*leonianum*	purple, dark	
BH	*lindmanianum*	purple, dark	red, dark
WA	*palenquense*	purple, dark	
EA	*tarapotense*	purple, dark	
WA	*campii*	purple, light	
EA	*solomonii*	purple, pinkish	
GH	*bonplandii* subsp. *guayanum*	purple, reddish	purplish violet
LA	*remotigeniculatum*	purple, reddish	
WA	*barclayanum*	purplish	reddish brown
LA	*bonplandii* subsp. *cuatrecasii*	purplish?	
EA	*pachylaminum*	purplish?	
LA	*pranceanum*	violet	
LA	*uleanum* var. *nanayense*	violet	
LA	*vaupesianum*	violet	
LA	*atropurpureum* var. *arenicola*	violet-purple	
AH	*caucavallense*	violet-purple	
AH	*dombeyanum*	violet-purple	
LA	*ernestii* var. *oellgaardii*	violet-purple	
PSA	*fendleri*	violet-purple	reddish violet
EA	*harlingianum*	violet-red	purple, white
WA	*basirotundum*	wine red, deep	

* Primary = most frequently reported color.

Key to location codes: AH = Andean Highlands; BH = Brazilian Highlands; CAR = Caribbean; CRP = Costa Rica & Panama; CSA = Central & South America; EA = Eastern Andes; GH = Guiana Highlands; LA = Lowland Amazonas; MCA = Mexico & Central America; NSA = Northern South America; PSA = Panama & South America; SBR = S. Brazil; WA = Western Andes; WCS = West Indies, Central America, South America; WSA = West Indies & South America.

bers of series *Multinervia*. Thus, based on fruit color, there appears to be a clear separation between Central American and South American species of sect. *Pachyneurium*. This will be further discussed under breeding behavior (see Cytology section). White or yellow fruits are rare in sect. *Pachyneurium*. Yellow berries are known only for *A. halmoorei*, an isolated species from western Mexico. Whitish berries are known only for *A. nizandense* from Mexico, *A. bradeanum* from Costa Rica and Panama, and *A. coriaceum* from southern Brazil. None of the above species are closely related.

Seeds. Like those of most species of *Anthurium*, the seeds of sect. *Pachyneurium* are one per locule, though one frequently aborts, leaving a one-seeded fruit. Seeds are commonly oblong or oblong-elliptic and are weakly flattened with the basal end rounded and the apical end obtusely notched where the funicle is attached. Typically, seeds are attached to the inner surface of the carpel wall by means of a slender mucilaginous strand, and one or both ends may bear a sticky, usually amber-colored appendage, which aids in dispersal. Sometimes the entire seed is enveloped in a mucilaginous envelope, which may protrude at both ends. A more uncom-

TABLE 2. Fruit colors in *Pachyneurium* by locality.

	Pachyneurium fruit colors				
	Yellowish, greenish yellow	Greenish, greenish white, white, cream	Orange, red-orange	Red, reddish, orange-red	Purple, red-purple, maroon, violet
Mexico & Central America (excluding Costa Rica & Panama)	*halmoorei*	*nizandense*		*cubense**	
				salvadorense	
				schlechtendalii	
				subsp. *schlechtendalii*	
				subsp. *jiminezii*	
Costa Rica & Panama	*acutifolium*	*consobrinum*	*brenesii*	*concolor*	
	bradeanum		*colonicum*		
	fatoense		*cotobrusii*	*cubense**	
			luteynii	*eximium*	
			nervatum		
			prolatum	*schottianum*	
			protensum	*upalaense*	*fendleri**
			subsp. *protensum*		
			subsp. *arcuatum*		
			pseudospectabile		
			purpureospathum		
			ranchoanum		
			seibertii		
			spectabile		
			standleyi		
			validifolium		
Central America/northern South America				*salviniae*	
Northern South America			*johnsoniae*	*anorianum*	*fendleri*
				*concolor**	*jenmanii*
				crassinervium	
West Indies & Circum-Caribbean			*venosum*	*crenatum*	*jenmanii**
Caribbean South America				*cubense*	
			*cubense**		*wagenerianum*

TABLE 2. Continued.

	Pachyneurium fruit colors				
	Yellowish, greenish yellow	Greenish, greenish white, white, cream	Orange, red-orange	Red, reddish, orange-red	Purple, red-purple, maroon, violet
Lowland Amazon Basin				*plowmannii*	*atropurpureum*
					var. *atropurpureum*
					var. *arenicola*
					bonplandii
					subsp. *bonplandii*
					subsp. *cuatrecasii*
					ernestii
					var. *ernestii*
					var. *oellgaardii*
					loretense
					oxycarpum
					uleanum
					var. *uleanum*
					var. *nanayense*
					willifordii
					pendulifolium
					pranceanum
					remotigeniculum
					superbum
					vaupesianum
Eastern slopes of Andes Mountains				*fasciale*	*harlingianum*
					latissimum
					llewelynii
					pachylaminum
					paraguayense
					var. *coroicoanum*
					var. *paraguayense*
					reflexinervium
					solomonii
					tarapotense

TABLE 2. Continued.

	Pachyneurium fruit colors				
	Yellowish, greenish yellow	Greenish, greenish white, white, cream	Orange, red-orange	Red, reddish, orange-red	Purple, red-purple, maroon, violet
Western slopes of Andes Mountains			*acutissimum* *angustilaminatum* *holmnielsenii* *oxyphyllum*	*carchiense* *sparreorum*	*barclayanum* *basirotundum* *campii* *lennartii* *napeaum* *obscurinervium* *pallenquense* *pallatanguense* *simpsonii*
Brazilian Highlands					*affine* *lindmanianum*
Lowland southern Brazil		*coriaceum*			*solitarium*
Guiana Highlands					*bonplandii* subsp. *guayanum* *wurdackii*

* Species primarily from another geographical region, but present here as well.

TABLE 3. Fruit color percentages by region.

	Fruit colors % by location					
	Yellowish, greenish yellow	Greenish, greenish white, white, cream	Orange, red-orange	Red, reddish, orange-red	Purple, red-purple, maroon, violet	Total number of species
Mexico & Central America excluding Costa Rica & Panama	17%	17%		67%		6
Costa Rica & Panama	8%	8%	60%	20%	4%	25
Central & northern South America				100%		1
Northern South America			17%	50%	33%	6
West Indies & Caribbean			25%	50%	25%	4
Caribbean South America			50%		50%	2
Lowland Amazonas				6%	94%	17
Eastern Andes				10%	90%	10
Western Andes			27%	13%	60%	15
Brazilian Highlands				25%	75%	4
Lowland southern Brazil		100%				1
Andean Highlands				25%	75%	4
Guiana Highlands					100%	2
Total number of species	3	4	22	21	47	97

mon type of seed attachment is found in *A. bonplandii* and *A. wagenerianum*, where the seeds are attached by their apical end to the inner carpel wall by a thick strand of fibers running down the carpel wall toward the base of the fruit.

FRUITING BEHAVIOR

The production of fruits in *Anthurium* is generally similar for all sections, with the pistil and the tepals gradually enlarging in unison after pollination. Some species, e.g., *A. consobrinum* and *A. colonicum*, have fruits that develop from an early-emergent pistil. In these cases, the pistil remains green until shortly before fruit maturation. In most species the developing fruit remains below the level of the tepals until very near the time of fruit maturation, or they emerge somewhat above the level of the tepals but remain uncolored. Shortly after anthesis the tepals generally begin to lose their coloration, often turning brownish, or they may become green and presumably photosynthetic. Coloration of fruits usually begins in the last one-third of their development, but may proceed slowly or promptly. Generally the berries remain firm even after full coloration, and for weeks before they begin to soften and loosen. In most species the softening of individual fruits is only partial and is widely scattered on the infructescence. The softened and generally plumper berries begin to emerge and may even be extruded and supported by threadlike tepalar fibers (narrow strips of epidermis from the inner surface of the tepals). This form of display broadens the visual target of the infructescence for bird dispersers and makes picking off the fruits much easier. In other cases, the mature berries are not extruded but merely become loosened and, if not removed, simply fall to the ground. Many examples have been seen where animals have fed on the infructescence only to leave the seeds scattered beneath the plant. Because the seeds are sticky, many even stick to the leaves of the same plant or other plants in the immediate vicinity.

By the time fruits are mature the tepals may have expanded to more than twice their original length, and the outer surface of the tepal (the only part regularly visible) may be expanded to a lesser extent, but they remain in appearance very much like they were originally. An exception to this occurs in *A. sparreorum*, which develops fruits in an almost unique manner for *Anthurium* (seen elsewhere only in an unidentified Ecuadorian member of sect. *Belolonchium*). In this species, the apical part of the tepal greatly expands and becomes white and fleshy, in reality taking on a role in fruit dispersal ecology since the fruits, though red at maturity, barely emerge above the tepals. Despite the fact that the fruits are not prominently exserted in the manner of other sect. *Pachyneurium* species, the red mature fruits are highly visible since they are displayed between the fleshy white tepals.

In most *Pachyneurium* species the infructescence is straight at maturity, but some taxa, such as *A. atropurpureum* and *A. pendulifolium*, may have a coiled infructescence when fully developed. This may serve to provide a more compact visual display to better attract dispersers, or perhaps it serves to spread out the time over which mature fruits are available for distribution by providing fewer fruits that are readily accessible at any time.

The amount of time required for fruits to develop varies greatly from species to species and may apparently vary considerably within each species as well (at least under greenhouse conditions). For species of sect. *Pachyneurium*, fruit development time under greenhouse conditions vary from as little as 3 months (for *A. llewelynii*) to as much as 13 months (for *A. salvadorense*). Fruit development time may vary greatly on successive pollinations. For example, fruit development time on *A. schlechtendalii* (see below) varied from 4.5 to 11 months, and on *A. upalaense* from 6 to 13 months, while *A. halmoorei* varied from 8.5 to 12 months.

Fruit development time

Species	Months to maturity (number of inflorescences observed)
A. atropurpureum arenicola	4 (2); 4.5 (4); 5 (1); 5.5 (2)
A. atropurpureum atropurpureum	9.5 (1)
A. barclayanum	12.5 (1); 13 (1)
A. colonicum	11 (2)
A. consobrinum	6 (1)
A. crassinervium	4.5 (1); 10.5 (1)
A. cubense	4.5 (1); 5 (1)
A. fendleri	10.5 (1); 11 (1); 11.5 (1)
A. halmoorei	8.5 (1); 9 (1); 10 (1); 11.5 (1); 12 (1)
A. llewelynii	3 (1)
A. luteynii	10 (1); 10.5 (1); 11 (1)
A. paraguayense	4 (1)
A. salvadorense	13 (1); 13.5; 15 (1)
A. schlechtendalii	4.5 (1); 11 (1)
A. standleyi	11 (1)
A. upalaense	6 (1); 7 (1); 13 (1)

PHENOLOGY

A phenological survey of greenhouse collections was undertaken by volunteer researcher Edwina Medlock. The study was carried out over a two-year period beginning November 1979 and ending in October 1981. Plants were observed on a weekly basis, and the initiation of new leaves and inflorescences was recorded. A total of 38 taxa of *Pachyneurium* was studied. The taxa involved in the study and the number of individuals of each species were as follows:

Anthurium affine	4
A. angustilaminatum subsp. *angustilaminatum*	2
A. barclayanum	1
A. bradeanum	1
A. brenesii	2
A. colonicum	2
A. concolor	1
A. consobrinum	2
A. coriaceum	1
A. cotobrusii	2
A. crassinervium	2
A. crenatum	2
A. cubense	2
A. eximium	1
A. fatoense	2
A. fendleri	2
A. halmoorei	2
A. jenmanii	3
A. luteynii	2
A. nervatum	1
A. oerstedianum	2
A. oxycarpum	1
A. plowmanii	1
A. protensum	
subsp. *arcuatum*	2
subsp. *protensum*	2
A. pseudospectabile	1
A. purpureospathum	2
A. salvadorense	3
A. salviniae	3
A. schlechtendalii	
subsp. *jimenezii*	1
subsp. *schlechtendalii*	2
A. schottianum	2
A. seibertii	2
A. spathiphyllum	2
A. standleyi	2
A. upalaense	2
A. validifolium	1
A. watermaliense	1

The following is a summary of the results of the survey.

Leaf production. Though many factors are involved in the production of both vegetative and fertile plant parts, including growing conditions (especially the amount of available light, nutrients, and humidity, as well as the general health of the plant), the collections were in general growing under moderately uniform conditions and were housed in the same room. Obviously some plants, owing to their larger size, received more light. The study showed that substantially more leaf production occurred during long daylength time periods (March to September) than during short daylength time periods. Though the greenhouse was heated, the nighttime temperature was allowed to drop to 65°F during the winter months, whereas in the warmer summer months the nighttime temperature often did not drop so low. Equally important, the daytime temperatures in the summer months were often very high, occasionally reaching 80°F, whereas in the cooler months such temperatures would have been rare.

During long days (March–September), a group of 71 individual study plants of sect. *Pachyneurium* produced an average of 120 leaves for the group per year, whereas during short days (September–February) the study plants produced only 94 leaves. Each of the study plants produced on the average four leaves per year during the two year study, but the range of new leaves produced was one new leaf per year produced on *A. pendulifolium* to 10 new leaves per year for *A. standleyi*. Plants performed better the first year of the study, producing an average of 4.5 leaves per year vs. 3.4 leaves per year during the second year. This was no doubt due to the increasing size of the plants and the fact that the larger the plants got the more they shaded one another, causing the poorer growers to obtain increasingly less light. The interval between leaf production was highly variable, with the minimum time between the production of new leaves ranging from 1 to 16 weeks (averaging 3 weeks), and the maximum interval between the production of new leaves ranging from 8 to 46 weeks (averaging 25.4). Production of new leaves was highly variable throughout the year for most species, with major leaf production activity between March and September. The maximum number of leaves produced during the two-year study was during March (a total of 56 over 2 years), and the minimum were produced during February and October (a total of 18 for each month). Frequently, most of the leaves produced by an individual were produced during the 4- or 5-month period following the initial burst in March. Another period that was important for some species was January, with one or more leaves being produced at that time (Fig. 22). The initiation of leaf production during the early months of the year is probably best explained by the fact that these months have increasingly longer days following a period of decreasing daylight in the late fall. Plants generally go through a period of low leaf production in the late fall when days are getting shorter, especially between September and December. The burst of activity in January is unusual since leaf production dropped off again in February only to increase once more in March (Fig. 22). During the period of maximum leaf production it is not uncommon for leaves on a single plant to be produced at the rate of one per week, though a period of two to three weeks between leaves is more common. Leaf production is greatest on younger plants and tends to slow after the plant has reached a more mature size. Leaf production can be markedly sporadic. For example, one plant of *A. brenesii* produced seven leaves in a 5-month period one year (March to July), then after producing one leaf in November, it did not produce another leaf until the following September. Leaf production on some species can be very slow. For example, an individual of *A. pendulifolium* (not included in the study) failed to produce a single leaf in more than a year, despite the fact that the plant appeared to be in good health and even flowered during this period. In general, healthy, robust plants produced more leaves than smaller or unhealthy plants, and there was a high correlation between leaf production and the amount of fertilizer applied, with most plants responding to increased fertilizer by growing faster and producing more leaves.

Flower production. Because each leaf axil ultimately produces an inflorescence on adult plants of *Anthurium*, the production of inflorescences on *Pachyneurium* closely follows the activity described for leaf production (Fig. 22), with the peak flowering activity also being in March, followed by a marked diminution until about June. During the warmer months flowering reaches an almost steady state, with 13–17 inflorescences produced each month between June and November for the 2-year period. As with leaf production, December and January show a spurt of flowering activity, with a trough in February, followed by a major spurt of activity in March. As with leaf production, the interval between inflorescence production is highly variable but does not necessarily follow the same pattern. Some species produce their inflorescences from the axil of the newly formed leaves shortly after the leaf emerges, whereas other species delay the production of new inflorescences for several weeks or even months after the new leaf emerges. The minimum average interval between the production of new inflorescences for all species in the 2-year study was 1.7 weeks (ranging from 1 to 14 weeks). The average maximum interval between the production of successive inflorescences was 29 weeks (ranging from 7 to 46 weeks). The duration of flowering for any single inflorescence is also highly variable, with some species flowering for a period of less than one week and others (such as *A. luteynii* and *A. salviniae*) flowering for a month or more. For a discussion of the phenology of fruit production, see the section on Fruiting Behavior.

CYTOLOGY By R. D. Sheffer

Species of sect. *Pachyneurium* are predominantly diploids with chromosome counts of $2n = 30$ and with fewer numbers of species being tetraploids with $2n = 60$ chromosomes. This corresponds to the most common number in the genus as a whole (Sheffer & Croat, 1983). While not all species have been counted, R. D. Sheffer has made chromosome counts on many of the species not previously covered in earlier publications. He reports (pers. comm.) that a few species do not fit the usual pattern. *Anthurium ranchoanum*, with two collections counted (*Croat 49846* and *Stevens*

13980), has a chromosome count of $2n = 44$. *Anthurium atropurpureum* var. *arenicola* exhibits aneuploidy at the tetraploid level.

An analysis done by Sheffer on a country by country basis indicates that there is a statistically significant difference between the number of polyploids in Central and South America. South America has more polyploids (41.3%) than Central America (10.7%). This suggests that the South American species are older and thus South America probably represents the center of origin of the section. This is borne out by the fact that the South American continent (especially the western edge of the Amazon basin and the foothills of the Andes in Ecuador and Peru) is also the area of greatest speciation in the group (see section on Geographical Distribution).

BREEDING BEHAVIOR (with R. D. Sheffer)

Breeding studies carried out by Sheffer at the Indiana University Northwest and by Croat at the Missouri Botanical Garden indicate that sect. *Pachyneurium* is probably reproductively isolated. Crossability between sect. *Pachyneurium* and other sections of the genus is very limited. Thus far there are only two examples of successful outcrossing with another section of *Anthurium* that resulted in the production of viable seedlings. These crosses were between the *Pachyneurium* species *A. standleyi* and *A. lilacinum*, a member of sect. *Urospadix* as well as *A. hacumense* (sect. *Porphyrochitonium*) and *A. glaucospadix* (sect. *Pachyneurium*). Though these were the only examples of crossability which produced viable seeds, studies show that there is potential crossability with other sections, if only fruit-set or seed production is considered as a significant measure of species relationship. Of the 433 cross-pollinations, 33 (7.4%) resulted in fruit-set and 28 (6.3%) resulted in seed production. These crosses were between sect. *Pachyneurium* and five other sections, *Belolonchium*, *Cardiolonchium*, *Dactylophyllium*, *Porphyrochitonium* and *Urospadix*. All, except the cases mentioned above (sects. *Urospadix* and *Porphyrochitonium*), resulted in abortive seeds that failed to germinate. This is further evidence that sect. *Pachyneurium* is reproductively isolated from other sections.

Besides being reproductively isolated from other sections of the genus, Central and South American species of sect. *Pachyneurium* are mostly reproductively isolated from one another. A total of 747 cross-pollinations within the section resulted in 116 (15.5%) with fruit-set and 88 (12%) with viable seedlings, which are probably hybrids (e.g., not merely cases of self-inducement to set fruits). Most of the pollinations that resulted in viable seedlings were among either Central American species or among South American species, but not between the respective groups. Thus, the Central American and South American species appear virtually isolated reproductively. Exceptions to the failure of crossability between Central and South American taxa are between *A. barclayanum* (Ecuador) and *A. cotobrusii* (Costa Rica and Panama), *A. crassinervium* (Venezuela) and *A. bradeanum* (Nicaragua–Panama). Also worthy of mention are two viable crosses between *A. halmoorei* (Mexico) and *A. fendleri*, which is largely from northern South America but also ranges into central Panama.

However, if production of fruits without viable seed is also considered, then two additional Central American vs. South American crosses become important. These were crosses between *A. halmoorei* and *A. uleanum* and between *A. halmoorei* and *A. latissimum*.

Other crosses that might prove viable (producing infructescences but as yet without mature fruits) are two South American species, *A. atropurpureum* var. *arenicola* and *A. harlingianum*, both of which seem to have crossed successfully with *A. nervatum* from Panama. Similarly, *A. bonplandii* subsp. *cuatrecasii* (South America) seems to have successfully crossed with both *A. halmoorei* (Mexico) and *A. purpureospathum* (Panama).

Anthurium crenatum, a West Indian species, shows apparent relationship with Central and South America, having been used in partially successful crosses (fruit matured but seeds inviable) with *A. halmoorei* (Mexico) and *A. fendleri* (northern South America and Panama), and also *A. glaucospadix* and *A. paraguayense* of South America.

Sheffer's study also indicates there may be limited interspecific gene flow throughout Central and South America, since 36% (27) of the 74 species tested by him have been involved in interspecific crosses that resulted in viable seed (seedlings viable or not).

While we have not attempted all possible crosses between different species of sect. *Pachyneurium*, the lists below summarize the successful crosses of the 226 cross-pollination attempts (including repeats of the same cross). The crosses involve 58 different taxa, of which 27 were successfully involved in crosses (produced viable plants).

Successful crosses of Central American species of *Pachyneurium*

A. consobrinum × *A. upalaense*
A. luteynii × *A. colonicum*

A. luteynii × *A. purpureospathum*
A. schlechtendalii × *A. salviniae*
A. schlechtendalii × *A. luteynii*
A. schlechtendalii × *A. upalaense*
A. standleyi × *A. halmoorei*
A. upalaense × *A. halmoorei*
A. upalaense × *A. purpureospathum*

Successful crosses of South American species of *Pachyneurium*

A. atropurpureum arenicola × *A. ernestii*
A. atropurpureum atropurpureum × *A. atropurpureum arenicola*
A. barclayanum × *A. atropurpureum arenicola*
A. barclayanum × *A. glaucospadix*
A. crassinervium × *A. barclayanum*
A. cubense × *A. atropurpureum arenicola*
A. fendleri × *A. atropurpureum arenicola*
A. fendleri × *A. remotigeniculatum*
A. harlingianum × *A. oxycarpum*
A. llewelynii × *A. ernestii*
A. paraguayense × *A. llewelynii*
A. tarapotense × *A. plowmanii*

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of *Anthurium* sect. *Pachyneurium* is summarized in the geographical checklist in Appendix 4. Although sect. *Pachyneurium* is widely dispersed throughout the Neotropics, ranging from Mexico to the West Indies and south to Argentina (from ca. 22° north to ca. 27° south), there are major centers of speciation. Species diversity is greatest from Costa Rica to Peru, with a major center in Ecuador (36 spp.) and to a lesser extent in Peru (28 spp.), and with minor centers in Costa Rica and Panama (both with 23 spp.), and the Guiana region (14 spp.), mostly in Venezuela.

A detailed analysis of the geographical distribution of *Anthurium* sect. *Pachyneurium* by area follows:

Mexico. This area is important as an area of local endemism (see section on Centers of Endemism below), with five of its seven taxa endemic. One wide-ranging species, *A. schlechtendalii*, consists of two subspecies ranging down either coast with an extension of the typical subspecies into Nicaragua. Another species, *A. salviniae*, extends from the moist forests on the Pacific slope of Chiapas to Colombia, while the remaining five species are endemic. One, *A. halmoorei*, is restricted to Michoacán, Nayarit, and Jalisco on the Pacific coast, while *A. nizandense* is found in Oaxaca and Guerrero. Along with *A. sarukhanianum*, endemic to Michoacán, these species occur in dry habitats as does *A. schlechtendalii* subsp. *jimenezii*, which is widespread on the Pacific coast. The fifth endemic species, *A. machetioides*, occurs in the humid Chinantla region of northeastern Oaxaca.

Central America (excluding Costa Rica and the wet southeastern corner of Nicaragua). This region is remarkably low in species, with only *A. cubense* (a species better known from the West Indies and northern Venezuela and inhabiting only the drier areas), *A. salvadorense* (from dry areas in northern El Salvador and adjacent Guatemala), *A. salviniae*, and *A. schlechtendalii* (present throughout most of this range). The latter two are the only widespread species. Four additional species occur in Nicaragua, *A. consobrinum*, *A. bradeanum*, *A. spathiphyllum*, and *A. upalaense*, but only the last extends much beyond the wet southeastern corner of the country.

Costa Rica. This country is a minor center of endemism and is rich in species diversity. While most species occur in the wet Atlantic lowlands or at higher elevations in the Cordillera de Talamanca (including *A. brenesii*, *A. bradeanum*, *A. consobrinum*, *A. fatoense*, *A. protensum*, *A. ranchoanum*, *A. schottianum*, *A. spectabile*, and *A. upalaense*), several taxa are restricted to the Pacific coast. *Anthurium cubense* occupies only dry areas of Guanacaste and Puntarenas provinces. Several species are restricted to the Pacific slope in the southeastern part of the country, mostly in the vicinity of the Osa Peninsula. These include *A. acutifolium* var. *acutifolium*, *A. acutifolium* var. *herrerae*, *A. eximium*, *A. oerstedianum*, and *A. standleyi*. Only *A. salviniae* is relatively widespread on both the Atlantic and Pacific watersheds.

In addition to being high in species diversity of sect. *Pachyneurium*, Costa Rica is also rich in endemism, with 7 of 23 species endemic. The endemics are *A. acutifolium* var. *herrerae*, *A. brenesii*, *A. eximium*, *A. oerstedianum*, *A. schottianum*, *A. spectabile*, and *A. standleyi*.

Panama. While Panama is similar to Costa Rica in having most of its species of *Pachyneurium* restricted to the Atlantic slopes, more species straddle the Continental Divide than in Costa Rica. Few species are restricted to lower elevations along the Atlantic coast (*A. concolor* and *A. spathiphyllum*), but among those primarily restricted to the Atlantic slope and to the ridges near the Continental Divide on the Pacific slope are *A. bradeanum*, *A. colonicum*, *A. consobrinum*, *A. hammelii*, *A. pseudospectabile*, *A. purpureospathum*, *A. ranchoanum*, *A. seibertii*, and *A. validifolium*. Three species are restricted to the Pacific slope, *A. acutifolium* (Burica Peninsula), *A. cubense* (lowland Chiriquí), and *A. fendleri* (Coclé). As in Costa Rica, *A. salviniae* is distributed widely on both the Atlantic and Pacific slopes. Four species are found on both slopes near the Continental Divide. These are *A. luteynii*, *A. nervatum*, *A. protensum* subsp. *arcuatum*, and *A. pseudospectabile*.

Panama is one of the major centers of endemism in Central America, being about as rich in endemics as Costa Rica, with 5 of 22 species endemic. Endemic species are *A. colonicum*, *A. hammelii*, *A. luteynii*, *A. nervatum*, *A. pseudospectabile*, and *A. purpureospathum*.

Colombia. The *Pachyneurium* species of Colombia are widely dispersed with no particular areas of species diversity. A few species are widespread and range into the country from Central America, the West Indies, or Venezuela. These include *A. salviniae*, which ranges from southern Mexico to the upper Magdalena River Valley in south-central Colombia; *A. fendleri* and *A. crassinervium*, which enter from northern and western Venezuela; and *A. cubense*, which ranges throughout the western periphery of the Caribbean. An additional species, *A. concolor*, enters the north from Panama. There are two endemic species inhabiting the northern part of the country, *A. johnsoniae*, from the Sierra de Santa Marta, and *A. anorianum* from northern Antioquia. Two additional and more widespread endemics occur in the central highlands of the country, *A. caucavallense* and *A. glaucospadix*.

The majority of *Pachyneurium* taxa from Colombia occur in the Amazon basin in the southern part of the country. These include *A. atropurpureum* var. *atropurpureum*, *A. atropurpureum* var. *arenicola*, *A. bonplandii* subsp. *bonplandii*, *A. bonplandii* subsp. *cuatrescasii*, *A. galactospadix*, *A. harlingianum*, *A. loretense*, *A. oxycarpum*, *A. pendulifolium*, and *A. vaupesianum*. Of these only *A. vaupesianum* is restricted to Colombia, the remainder being relatively widespread in the Amazon basin.

It is interesting that while Colombia has the greatest species diversity for the genus as a whole, possibly with as many species of *Anthurium* as all the rest of Latin America put together, it is not particularly rich in sect. *Pachyneurium*. This owes to the fact that most of the species diversity for the genus is in the wettest part of the country along the Pacific coast, while the more mesic parts of the country have been long deforested and are isolated from the apparent center of species diversity for sect. *Pachyneurium*, namely Amazonian Ecuador and Peru. Only four species of *Pachyneurium* occur on the otherwise aroid-rich Pacific slope of Colombia. One of these, *A. caucavallense*, laps over the Divide of the Eastern Cordillera in Valle, occurring only on dry upland slopes, and is a member of series *Pachyneurium*. Three other species, *A. carchiense*, *A. napaeum*, and *A. narinoense*, all members of series *Multinervia*, occur in wetter areas in Nariño. Though it is not unusual that there are no representatives of series *Pachyneurium* from the wet Pacific slope (since they prefer drier habitats), it is unusual that so few members of series *Multinervia* (a group preferring mesic habitats) occur there. It is particularly curious that only three of the species in series *Multinervia* occur in this part of Colombia, since there would appear to be numerous suitable habitats for these mesic taxa in southwestern Colombia in Nariño, Cauca, and Valle. Perhaps further collecting in these poorly known areas of Colombia will turn up additional species or records for this group. The area is still largely unexplored. Colombia has relatively few endemic species, with only 6 of 24 endemic. These are *A. anorianum*, *A. caucavallense*, *A. glaucospadix*, *A. johnsoniae*, *A. narinoense*, and *A. vaupesianum*.

Ecuador. Along with Peru, this area represents the major center of diversity for taxa of sect. *Pachyneurium*, with species concentrated primarily in the Amazon lowlands of both countries and on both slopes of the Andes in Ecuador. Considering its relatively small size compared to the surrounding countries, Ecuador is clearly the richest country in species diversity. The country is broken up into several different phytogeographical regions, but each contributes a considerable share of the total number of species. Those taxa that occur principally in the Amazonian lowlands are *A. atropurpureum* var. *arenicola*, *A. ernestii*, *A. pendulifolium*, *A. superbum*, *A. tenaense*, and *A. uleanum*. Several other species occur only on the eastern slopes of the Andes but at higher elevations, usually above 500 m. These include *A. bushii*, *A. harlingianum*, *A. penningtonii*, and *A. santiagoense*. *Anthurium bushii* and *A. santiagoense* are restricted to the Río Santiago drainage system. *Anthurium oxycarpum* is wide-ranging, extending from the lowlands up to 850 m.

Only two species, *A. dombeyanum* and *A. leonianum*, occur in the drier highland regions of Ecuador. Most of the remaining species of sect. *Pachyneurium* in Ecuador are restricted to the Pacific slope. In this respect Ecuador is radically different from Colombia, since only three species of *Pachyneurium* occur on the wet Pacific slope in Colombia. Species that occur at lower elevations on the Pacific slope include *A. asplundii*, *A. barclayanum*, *A. linguifolium*, *A. manabianum*, *A. napaeum*, and *A. sparreorum*. No species is known to occur on both slopes of the Andes. This is not unusual considering the age of the Andes and the broad stretch of cold, arid, and generally inhospitable land lying between the mesic slopes to the east and west.

Ecuador has the largest number (36), as well as the highest concentration of endemic *Pachyneurium* species of any country, the endemics constituting more than half of the total species. Many of the endemics are members of series *Multinervia* and include *A. acutissimum*, *A. angustilaminatum*, *A. fasciale*, *A. holmnielsenii*, *A. lennartii*, *A. napaeum*, *A. oxyphyllum*, *A. palenquense*, *A. pallatangense*, *A. penningtonii*, and *A. santiagoense*. Series *Multinervia* is almost endemic to Ecuador, with only three species, *A. carchiense*, *A. napaeum*, and *A. narinoense*, occurring in southwestern Colombia, and two species, *A. soukupii* and *A. ottonis*, occurring to the south in Peru and Bolivia.

Peru. Peru is the second richest country for species of sect. *Pachyneurium*. If only the members of series *Pachyneurium* are considered, Peru is actually richer than Ecuador because about one-third of the Ecuadorian members of the section are members of series *Multinervia*. Most species of series *Multinervia* occur in Ecuador, while relatively few occur in adjacent countries. Nearly all of the Peruvian species of sect. *Pachyneurium* are members of series *Pachyneurium*. The vast majority of Peruvian *Pachyneurium* species occur on the eastern slope of the Andes and in the Amazon lowlands. Taxa occurring in the lowlands of the Amazon basin include *A. atropurpureum* var. *atropurpureum*, *A. atropurpureum* var. *arenicola*, *A. galactospadix*, *A. loretense*, *A. manuanum*, *A. pendulifolium*, *A. superbum* subsp. *brentberlinii*, *A. uleanum* var. *nanayense*, and *A. willifordii*.

Almost an equal number of species occurs in the foothills of the Andes at medium elevations (300–1,000 m). These include *A. basirotundum*, *A. harlingianum*, *A. knappiae*, *A. latissimum*, *A. llewelynii*, *A. manuanum*, *A. pachylaminum*, *A. reflexinervium*, *A. remotigeniculatum*, and *A. tarapotense*. The majority of these species are from the northern half of Peru, especially in the departments of Amazonas, San Martín, and Huánuco. Areas of particularly high concentration of *Pachyneurium* are the areas around Tingo María in Huánuco Department, and around Tocache Nuevo and Tarapoto in San Martín Department. The Tarapoto vicinity, for example, has no fewer than five *Pachyneurium* species.

Several other species are restricted to the eastern slopes of the Andes and in the Amazon lowlands but are more wide-ranging in elevation, occurring in the lowlands and in the foothills of the Andes. These include *A. ernestii*, *A. oxycarpum*, and *A. plowmanii*.

Two species, *A. dombeyanum* and *A. soukupii*, are restricted to higher elevations in Peru and range from Cusco Department in the south to Amazonas Department in the north. While the former occupies mostly dry life zones, the latter inhabits generally wetter sites in various montane forest life zones. One species, *A. ottonis*, occurs at higher elevations in the far south of Peru in Puyo Department, as well as in adjacent Bolivia. Two species, *A. barclayanum* and *A. simpsonii*, are restricted to the moist forests of the Pacific slope of northwestern Peru in Tumbes Department.

After Ecuador, Peru has the greatest concentration of series *Pachyneurium* taxa. It also has the second highest concentration of endemic species, with 13 of 28 endemic taxa. These are: *A. basirotundum*, *A. knappiae*, *A. latissimum*, *A. llewelynii*, *A. manuanum*, *A. pachylaminum*, *A. reflexinervium*, *A. remotigeniculatum*, *A. simpsonii*, *A. superbum* subsp. *brentberlinii*, *A. tarapotense*, *A. uleanum* var. *nanayense*, and *A. willifordii*.

Bolivia, Paraguay, and Argentina. A total of nine taxa inhabit this southern, subtropical and temperate region of South America. The only species common to all three countries is *A. paraguayense* (also in southern Mato Grosso in Brazil), and only Bolivia has endemic taxa, *A. atropurpureum* var. *thomasii* and *A. solomonii*. *Anthurium paraguayense* ranges the furthest south of all members of sect. *Pachyneurium* and is the only member of the section in Argentina. One species, *A. plowmanii*, is common to both Paraguay and Bolivia, occurring in the Amazon lowlands with its southern extension in central Paraguay. Bolivia, the most tropical of the three countries, is the richest in species, with nine taxa. These are: *A. atropurpureum* var. *arenicola*, *A. atropurpureum* var. *thomasii*, *A. ottonis*, *A. oxycarpum*, *A. paraguayense* var. *paraguayense*, *A. paraguayense* var. *coroicoanum*, *A. plowmanii*, *A. solomonii*, and *A. soukupii*. In Bolivia (in contrast to its range in Peru), *A. oxycarpum* occurs only in the lowlands in El Beni Province. *Anthurium atropurpureum* var. *arenicola* is also a lowland species, known from La Paz Department at less than 20 m. *Anthurium atropurpureum* var. *thomasii* occurs at about 750 m in the isolated Serranía de Huanchaca, near the eastern border of the country. *Anthurium plowmanii* ranges from the lowlands of Bolivia to 900 m in Santa Cruz Department. *Anthurium paraguayense*, entering Bolivia from more temperate Argentina and Paraguay, ranges very widely in Bolivia, occurring from 200 to 1,700 m. The remaining four Bolivian species, *A. ottonis*, *A. paraguayense* var. *coroicoanum*, *A. solomonii*, and *A. soukupii*, occur only at higher elevations, all being known only from the Yungas in the Department of La Paz at 800 to 2,200 m.

Brazil. Brazil, with 18 species, is relatively rich in species, but considering the broad area encompassed and that the species are not concentrated in any particular area, it is not important as a center of species diversity. The *Pachyneurium* species of Brazil are generally widely dispersed except in the upper Amazon region, especially in Acre, where as many as four species can be found in a small area. Elsewhere, in general, no more than one or two species are present at any site and may be scarce when present. The area of greatest concentration of species in Brazil is in the upper Amazon region in the western part of the states of Amazonas and Acre. This is understandable since, in general, species diversity for the family increases in the Amazon basin as one approaches the Andes from the Amazon lowlands and is probably greatest at 500 to 1,500 m on the Andean slopes. Taxa that are restricted to the western Amazon basin in Brazil include *A. atropurpureum* var. *atropurpureum*, *A. atropurpureum* var. *arenicola*, *A. ernestii* var. *ernestii*, *A. galactospadix*, *A. krukovii*, *A. oxycarpum*, *A. pranceanum*, and *A. uleanum*. Another species, *A. plowmanii*, occurs in the same region as well, but extends much further to the east, ranging throughout the Amazon basin to Manaus, as well as east to Mato Grosso and south to Rondônia and Acre. Two species are restricted to the upland regions of central Brazil south of Pernambuco and south of the Amazon basin. One of these, *A. affine*, ranges from Minas Gerais to Pernambuco, south to Mato Grosso do Sul and Espíritu Santo, but is centered mainly in Bahía. The other species, *A. lindmanianum*, ranges from Pará, south to Rondônia, Mato Grosso, and Goiás.

Two species, *A. coriaceum* and *A. solitarium*, occur in southeastern Brazil, in southern Minas Gerais, Espíritu Santo, Paraná, Guanabara, and Rio de Janiero states. They commonly occur on rocks in seasonally dry areas with scrubby vegetation. One species, *A. paraguayense*, occurs in southeastern Brazil in Mato Grosso do Sul near the Paraguay border. Three species occur in northern Brazil. One of these, *A. bonplandii* subsp. *bonplandii*, is wide-ranging, occurring principally north of the Amazon River, and extending from the border with Peru to north-central Pará State, but is also sparsely distributed to the south of the Amazon River in the states of Amazonas and Pará. The other two species, *A. jenmanii* and *A. cataniapoense*, occur only in northeastern Brazil in Amapá and Pará, respectively. Both range into Brazil from Venezuela or the Guianas.

One-third of the Brazilian species are endemic to Brazil. These include *A. affine*, *A. coriaceum*, *A. krukovii*, *A. lindmanianum*, *A. pranceanum*, and *A. solitarium*.

Venezuela. The Venezuelan species can be for the most part separated geographically and can occupy diverse phytogeographical regions including the northern Amazon basin, the Guiana Highlands, the northeastern periphery as well as the Cordillera de la Costa, the Cordillera de Mérida, and the Serranía de Perijá. With nine of the 14 Venezuelan species occurring in the Guiana region (with the highlands and the surrounding lowlands), that region constitutes a minor center of diversity for sect. *Pachyneurium*. If the non-Venezuelan parts of the Guianas are included, three more endemic species would be added, *A. cowanii*, *A. lanjouwii*, and *A. maguirei*. Seven species with eight taxa occur in the far south of Venezuela in the Guiana Highlands and the adjacent northern Amazon basin. These are *A. bonplandii* subsp. *bondplandii*, *A. bonplandii* subsp. *cuatrecasii*, *A. cataniapoense*, *A. guanchezii*, *A. iramirezae*, *A. vinillense*, *A. wurdackii*, and *A. xanthoneurum*. One additional species which ranges into the Amazon basin is *A. jenmanii*. This species has an unusual distribution in that it also occurs in Trinidad and the eastern end of the Cordillera de la Costa bordering the Caribbean, then ranges east and south through the Guiana lowlands to Amapá State in Brazil. It is the only species besides *A. fendleri* that enters the Amazon basin and also occurs primarily outside of the Amazon basin.

Five taxa, *A. bonplandii* subsp. *guayanum*, *A. iramirezae*, *A. vinillense*, *A. wurdackii*, and *A. xanthoneurum*, are restricted to the Guiana Highlands. One species, *A. wagenerianum*, is restricted to the Cordillera de la Costa in northern Venezuela. Two additional species, *A. crassinervium* and *A. fendleri*, inhabit the Cordillera de la Costa but also range throughout the Cordillera de Mérida and into Colombia. In addition, disjunct populations of *A. fendleri* occur in the western Cordillera and the Chocó of Colombia as well as in Panama. *Anthurium cubense* is restricted to the northwestern part of the country in the Serranía de Perijá west of Lake Maracaibo (Zulia State) and to the east in Falcón. This species inhabits generally drier areas around the western and southern margins of the Caribbean.

Venezuela has more than one-third of its species endemic, including *A. guanchezii*, *A. iramirezae*, *A. vinillense*, *A. wurdackii*, and *A. xanthoneurum* in the Guiana region. *Anthurium wagenerianum* is essentially endemic, being otherwise known only from Curaçao.

The Guianas. Like much of eastern South America, the Guianas are relatively low in species diversity. The region has only five known species of sect. *Pachyneurium*, with a sixth species purportedly described from the region but never found (*A. martianum*). Only one of the five species, *A. jenmanii*, occurs in the lowlands ranging from Venezuela, down the coast of the Guianas to Amapá in Brazil. It is the only species known for certain from French Guiana. The highland species are *A. bonplandii* subsp. *guayanum*, known from Surinam; *A. cowanii*, endemic to Guyana; *A. lanjouwii* and *A. maguirei*, endemic to Surinam.

Despite the low number of species in the Guiana region, the rate of endemism is high, with three of the five species endemic. If *A. martianum* (purportedly from Surinam) really did come from Guyana, the rate of endemism for this area would be higher still.

West Indies. Section *Pachyneurium* in the West Indies is restricted to the Greater Antilles and to some of the smaller islands in the region, notably the Virgin Islands. Only three species occur in the Lesser Antilles, *A. jenmanii* on Trinidad and Tobago, and *A. crassinervium* and *A. wagenerianum* on Curaçao. A sect. *Pachyneurium* look-alike, *A. hookeri*, occurs more widely in the Lesser Antilles, as far north as Montserrat. Cuba, the largest island of the Greater Antilles, has only two species of *Pachyneurium*, *A. cubense* and *A. venosum*. *Anthurium cubense* also ranges to Central and South America, while *A. venosum* possibly ranges to Jamaica (see discussion under *A. venosum* for details of differences of Jamaican material). Hispaniola has but a single species, *A. crenatum*. This is the most wide-ranging species of sect. *Pachyneurium* endemic to the West Indies, ranging from Hispaniola to Puerto Rico and the Virgin Islands. Puerto Rico has one species, *A. crenatum*, and St. John, Virgin Islands has one endemic species, *A. selloum*.

While three of the six West Indian species of *Pachyneurium* are endemic to the West Indies, only *A. selloum* is endemic to a particular island.

CENTERS OF ENDEMISM (General Comments)

It is illustrative to look at the distribution of endemic species, since this does not always coincide with the centers of maximum species diversity for sect. *Pachyneurium*. Although Ecuador and Peru again come out on top with 23 and 13 endemic taxa, respectively, several countries have between ¼ and ¾ of their taxa endemic. Mexico has 5 of its 7 taxa endemic, while Costa Rica has 7 of 23, Panama 5 of 23, Colombia 6 of 24, Venezuela 5 of 14, Guyana 2 of 3, Brazil 6 of 18, and the West Indies 3 of 6. In contrast, there are no endemic species in Central America outside of Costa Rica. These patterns in Central America are reflected in the genus as a whole (Croat, 1987), where Mexico as well as Panama and Costa Rica are shown to be major centers of endemism.

There are 79 taxa endemic to individual countries throughout the range of sect. *Pachyneurium*. Although the rate of endemism, country by country, is not a particularly useful index, since some countries, e.g., Brazil, are vastly larger than others, such as Ecuador, Costa Rica, or Panama, the overall rate of endemism for sect. *Pachyneurium* is relatively high. If we consider all the countries in Central America and South America as well as Cuba, Hispaniola, and Puerto Rico, there are an average of 3.7 species endemic for each. Central America considered alone has 19 endemics, while South America has 59 and the West Indies has 3.

Endemism, it would appear, is no indicator of the center of origin of sect. *Pachyneurium*, since endemics appear throughout the range of the section. Rather, endemism in the section appears to be more a matter of isolation, since for the most part the endemics are most common in areas where the relief is broken, or where there are isolated intermountain valleys, such as in the Andes of western South America or in the Guiana Highlands. Species in series *Multinervia*, which is particularly high in endemics (with all but 5 of 16 taxa endemic to Ecuador), reflects this well. Most occur in valleys on both slopes of the Continental Divide, where the degree of isolation tends to be high. Other causes for endemism may stem from isolation due to the discontinuous nature of life zones. For example, the Caribbean slope of Costa Rica and Panama is broken by discontinuous areas of tropical moist forest, premontane wet forest and tropical wet forest. *Anthurium prolatum*, for instance, is primarily restricted to areas of tropical wet forest in northeastern Costa Rica, while *A. concolor* is known principally from another wet area further to the east in Panama. These two regions are interrupted by a broad area of tropical moist forest in northeastern Panama and southeastern Costa Rica.

Relatively few species inhabiting upland regions are very widespread, but some, such as *A. dombeyanum*, are moderately wide-ranging, extending from southern Peru to northern Ecuador. Other wide-ranging species occur mostly from near sea level to middle elevations. Among such species are: *A. schlechtendalii* (Mexico to Nicaragua), *A. salviniae* (Mexico to south central Colombia), *A. fendleri* (Amazonian Colombia to Panama), and *A. cubense* (Cuba to Central America and northern South America).

In contrast, the lowland species, such as those inhabiting the Amazon basin, are much more widespread, e.g., *A. atropurpureum*, *A. bonplandii*, *A. ernestii*, *A. plowmanii*, and *A. uleanum*.

Endemic *Anthurium* species by region are summarized in the following list:

West Indies (3)
- *crenatum*
- *selloum*
- *venosum*

Mexico and Central America (excluding Costa Rica & Panama) (6)
- *halmoorei*
- *machetioides*
- *nizandense*
- *salvadorense*
- *sarukhanianum*
- *schlechtendalii*

Costa Rica and Panama* (25)
- *acutifolium*
- *bradeanum*
- *brenesii*
- *colonicum*
- *consorbrinum*
- *cotobrusii*
- *eximium*
- *fatoense*
- *hammelii*
- *luteynii*
- *nervatum*
- *oerstedianum*
- *prolatum*
- *protensum*
- *pseudospectabile*
- *purpureospathum*
- *ranchoanum*
- *schottianum*
- *seibertii*
- *spathiphyllum*
- *spectabile*
- *standleyi*
- *upalaense*
- *validifolium*
- *watermaliense*

Northern South America (extra-Amazon) (8)
- *anorianum*
- *caucavallense*
- *crassinervium*
- *glaucospadix*
- *jenmanii*
- *johnsoniae*
- *wagenerianum*
- *fendleri***

Coastal lowlands of western South America (5)
- *asplundii*
- *barclayanum*
- *linguifolium*
- *manabianum*
- *simpsonii*

Andes, western slope (15)
- *acutissimum*
- *angustilaminatum*
- *bucayanum*
- *campii*
- *carchiense*
- *holmnielsenii*
- *lennartii*
- *leonianum*
- *napaeum*
- *narinoense*
- *obscurinervium*
- *oxyphyllum*
- *palenquense*
- *pallatangense*
- *sparreorum*

Andes, eastern slope (21)
- *basirotundum*
- *bushii*
- *curtispadix*
- *dombeyanum*
- *fasciale*
- *harliangianum*
- *knappiae*
- *latissimum*
- *llewelynii*
- *manuanum*
- *ottonis*
- *pachylaminum*
- *paraguayense*
  - var. *coroicoanum*
- *penningtonii*
- *reflexinervium*
- *remotigeniculatum*
- *santiagoense*
- *solomonii*
- *soukupii*
- *tarapotense*
- *tenaense*

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* Some extending into the southeastern part of Nicaragua.

** Rare in Panama.

*** Counts refer to species, not taxa, i.e., not including varieties and subspecies except where split into separate endemic regions.

Guiana Highlands (8)
- *bonplandii* subsp. *guayanum*
- *cowanii*
- *iramirezae*
- *lanjouwii*
- *maguirei*
- *vinillense*
- *wurdackii*
- *xanthoneurum*

Amazon basin (17)
- *atropurpureum*
- *bonplandii*
  - ***subsp. *bonplandii*
  - subsp. *cuatrecasii*
- *cataniapoense*
- *ernestii*
- *galactospadix*
- *guanchezii*
- *krukovii*
- *loretense*
- *oxycarpum*
- *pendulifolium*
- *plowmanii*
- *pranceanum*
- *superbum*
- *uleanum*
- *vaupesianum*
- *willifordii*

Brazilian Highlands of south-central and eastern Brazil (2)
- *affine*
- *lindmanianum*

Southeastern Brazil (2)
- *coriaceum*
- *solitarium*

Temperate and subtropical South America (1)
- *paraguayense* var. *paraguayense*

Species not included in areas of endemism (4)
- *concolor*, Panama to northern Colombia
- *cubense*, circum-Caribbean
- *martianum*, location not known
- *salviniae*, Mexico to northern Colombia

ABUNDANCE

Despite the fact that *Pachyneurium* species are not very wide-ranging in general (see section on Geographical Distribution), species are commonly quite abundant on a local basis. For example, *A. atropurpureum* var. *arenicola* is rare in Brazil in Rondônia, near an extreme of its range, but abundant locally around Iquitos. Species such as *A. anorianum*, *A. pachylaminum*, *A. penningtonii*, *A. pseudospectabile*, *A. reflexinervium*, *A. salvadorense*, *A. schottianum*, *A. seibertii*, *A. standleyi*, and others that have relatively narrow ranges are nevertheless often very abundant locally.

In an area where any species occurs the plants commonly dominate the local epiphytic landscape, due to their generally large size, conspicuous habit, and ability to adapt to a wide variety of local conditions. Typically, epiphytic species adapt readily to other niches such as on rocks or limestone outcrops within a forest understory or on steep road cuts or stream banks. While quite at home in the understory of a dense forest, plants there are usually much less numerous. While being able to withstand low light levels indefinitely, plants react quickly to openings that increase light levels. Clearing edges eventually become favorite sites for *Pachyneurium* species. Their ability to survive in the sunnier habitats, and their avian fruit-dispersal agents, always more prevalent in such habitats, are no doubt chiefly responsible for their much greater success in such open habitats. A single large plant that has been pollinated may produce thousands of seeds, many of which are scattered locally. Seedlings are in general quite successful, and a local population may soon consist of hundreds of plants, especially in disturbed sites. Predation by phytophagous insects seems to be only a minor problem, perhaps due to the tough epidermis and the seemingly lower number of phytophagous insects in the seasonally dry areas where *Pachyneurium* is most prevalent. The ability to survive in low-light conditions, as well as in high illumination with limited moisture, make *Pachyneurium* species preadapted for many abuses they might receive under cultivation. Indeed, some species, such as *A. schlechtendalii* are very common in cultivation. Their adaptations for conditions of seasonal drought apparently make them somewhat cold-resistant as well. A number of species cultivated in south Florida and in southern California are capable of surviving night temperatures at or near freezing.

INTERSPECIFIC RELATIONSHIPS

Although mention has already been made of a high degree of endemism within sect. *Pachyneurium* and the great dissimilarity between Central and South American species in the section, there are several important groups of related species. These groups are outlined below:

Group 1:
- *A. anorianum*
- *A. concolor*
- *A. crassinervium*
- *A. crenatum*
- *A. cubense*
- *A. halmoorei*
- *A. machetioides*
- *A. nizandense*
- *A. purpureospathum*
- *A. salvadorense*
- *A. salviniae*
- *A. schlechtendalii*
- *A. upalaense*

Occurring in Central America and mostly northern, extra-Amazonian South America, this group of species consists of typical members of series *Pachyneurium*, mostly with red fruits, typical rosulate habit, D-shaped petioles, often with abaxial ribbing. Although breeding studies between some of the Central and South American species have shown little relationship, all of the species listed here have probably have had at least ancient contact with one another. There are no mountain ranges separating these species and, indeed, two range throughout much of the area, namely *A. salviniae* and *A. cubense*.

Group 2:
- *A. brenesii*
- *A. colonicum*
- *A. cotobrusii*
- *A. hammelii*
- *A. luteynii*
- *A. nervatum*
- *A. prolatum*
- *A. protensum*
- *A. pseudospectabile*
- *A. ranchoanum*
- *A. seibertii*
- *A. spectabile*
- *A. standleyi*
- *A. validifolium*

This group, known almost exclusively from Costa Rica and Panama (a few lap over into the wet southeastern corner of Nicaragua), is characterized by its orange fruits. Many members of the group have cordate to subcordate, greenish-drying blades (in contrast to typical *Pachyneurium*), frequently with the collective veins arising from near the base.

Group 3:
- *A. acutifolium*
- *A. bradeanum*
- *A. consobrinum*
- *A. eximium*
- *A. spathiphyllum*

This small group is characterized by moderately thin, greenish-drying leaves, thin cataphylls which often persist intact, and less conspicuously colorful fruits, generally yellowish, greenish, or whitish (though tipped with red or purple in *A. consobrinum* and solid red in *A. eximium*). Fruits are not yet known for *A. spathiphyllum*, but it is believed to be closely related to *A. bradeanum*, which has white fruits. In addition, all but *A. acutifolium* have cylindroid or clavate spadices.

Anthurium schottianum and *A. oerstedianum* stand alone in Central America, seemingly not being closely related to any other species. The former is unusual in having a thin, cordate blade with free-ending basal veins and in its markedly seasonal flowering behavior (several inflorescences apparently synchronize to emerge at about the same time). While berry color is described as pinkish, darker toward the apex and possibly red, the species is not at all related to other red-fruited species in Central or South America. *Anthurium oerstedianum* is unknown as to fruit color, but with its strange leaf blades with the geniculum situated at the middle of the petiole, it seems to be unrelated to any other Central American species.

Group 4:
- *A. atropurpureum*
- *A. bonplandii*
- *A. cowanii*
- *A. fendleri*
- *A. guanchezii*
- *A. iramirezae*
- *A. jenmanii*
- *A. krukovii*
- *A. lanjouwii*
- *A. lindmanianum*
- *A. maguirei*
- *A. pachylaminum*
- *A. pendulifolium*
- *A. pranceanum*
- *A. remotigeniculatum*
- *A. vinillense*
- *A. wurdackii*
- *A. xanthoneurum*

Basically a group from the Guianas, lowland Amazonia and the Brazilian highlands, this group is characterized by purple fruits and the tendency to occur on granitic outcrops or on sandy soil or in areas of extensive white sand deposits. Many have pustules or glandular dots on the leaves, thin spathes, and minutely papillate tepals.

Group 5:
- *A. asplundii*
- *A. bushii*
- *A. cataniapoense*

A. harlingianum
A. loretense
A. vaupesianum

A closely related group of species with densely rosulate, mostly large, short-petiolate leaves, thin spathes, and long-tapered purplish spadices with minutely papillate tepals and purple fruits.

Group 6: *A. bucayanum*
A. campii
A. lennartii
A. manabianum
A. sparreorum

These species all occur on the Pacific slope of the Andes in Ecuador and have large, mostly green-drying leaves with short petioles, numerous primary lateral veins and a collective vein arising from near the base.

Group 7: *A. curtispadix*
A. ernestii
A. galactospadix
A. manuanum
A. tenaense
A. uleanum

A closely related group from western Amazonia, mostly at low elevations, frequently with minutely papillate tepals which dry with a crustose, frostlike appearance (most noticeable in *A. uleanum*) and mostly short petioles and peduncles.

Group 8: *A caucavallense*
A. dombeyanum
A. glaucospadix
A. latissimum
A. leonianum
A. llewelynii
A. paraguayense
A. reflexinervium
A. solomonii
A. tarapotense

These highland species with purple fruits share in common a tight rosulate habit, mostly short, D-shaped petioles, thick blades, and purplish spadices. Many have a tendency for the lowermost primary lateral veins to extend out from the midrib at a broad angle (most pronounced in *A. paraguayense* var. *coroicoanum*, *A. latissimum*, and *A. reflexinervium*). *Anthurium johnsoniae* perhaps also belongs here. Occurring in the mountains above Santa Marta in northern Colombia, this species would be unusual for the group in having orange fruits, but it shares many features in common with *A. caucavallense*, especially the broadly spreading primary lateral veins. Perhaps it is the result of an ancient hybridization between *A. crassinervium* (currently occurring in close proximity) and *A. caucavallense*, as it shares characteristics in common with both of these species.

Group 9: *A. superbum*
A. willifordii

This strange pair of species, no doubt closely related, is characterized by quilted leaves, sometimes tinged purplish or reddish below, short-pedunculate, stubby cylindroid spadices with many minute flowers per spiral, and lavender or magenta, often bicolorous fruits.

Group 10: *A. barclayanum*
A. linguifolium
A. simpsonii

These purple-fruited species all occur along the Pacific coast of South America in Peru and Ecuador, in generally arid areas (less so for *A. simpsonii*).

Group 11: *A. acutissimum*
A. angustilaminatum
A. carchiense
A. fasciale
A. holmnielsenii
A. narinoense
A. oxyphyllum

Most of these Andean species occur on the Pacific slope (*A. fasciale* occurs on the Atlantic slope) of Ecuador and have orange, red, or red-orange fruits. All are members of series *Multinervia* with oblong to oblong-elliptic blades and close primary lateral veins.

Group 12: *A. napaeum*
A. obscurinervium
A. ottonis
A. palaenquense
A. pallatangense
A. penningtonii
A. santiagoense
A. soukupii

All members of series *Multinervia*, these species have purple fruits or are most closely related to other members of series *Multinervia* with purple fruits. Many tend to have triangular petioles, sometimes sharply so.

Group 13: *A. knappiae*
A. oxycarpum

This pair of species, though not close geographically, seem very closely related. Both share moderately thin, veiny blades with the collective veins arising from the base. Though *A. oxycarpum* is moderately widespread in the Amazon lowlands and on the eastern slopes of the Andes, *A. knappiae* occurs only on the eastern slopes of the Andes in San Martín Department.

Among the South American species that appear to have no close relatives are *A. affine*, *A. coriaceum*, *A. plowmanii*, and *A. solitarium*.

Anthurium affine sometimes resembles *A. lindmanianum*, a species discussed above as having affinity with a relatively large group of lowland Amazonian species common on rocks and sand. *Anthurium affine*, like *A. lindmanianum*, is relatively isolated in the central highlands of Brazil and differs from all other species in the above group by its unusual spadix, which is generally broadest toward the apex.

Restricted to southeastern Brazil and in an area where no other *Pachyneurium* species occur, are two species, *A. coriaceum* and *A. solitarium*. They are apparently totally unrelated to each other.

Anthurium plowmanii appears to be quite anomalous, with its petioles narrowly sulcate with blunt margins adaxially and a spadix longer than the peduncle.

Aside from *A. crenatum* and *A. cubense*, which show relationships to other *Pachyneurium* species from Central America and northern South America, the other West Indian species show no close relationship with other members of the section. *Anthurium venosum*, endemic to Cuba, shows no features in common with any other species, and *A. selloum* (discussed elsewhere as a possible hybrid) likewise is unique among the West Indian species.

TAXONOMIC TREATMENT

Anthurium Schott, Wiener Z. Kunst 828. 1829 (3rd Quart.). LECTOTYPE: *Anthurium acaule* (Jacq.) Schott. *Pothos acaulis* Jacq., Enum. Syst. Pl. 31. 1760 (vide ING).

Herbs, usually epiphytic, less often terrestrial or lithophytic, the growth habit monophyllous or rarely polyphyllous sympodial; petioles variously shaped, usually conspicuously geniculate at apex; leaf blades simple to palmately divided or compound with the lesser veins reticulate; inflorescence terminal (but appearing axillary), one per leaf; spathe free, persistent; spadix uniformly tapered; flowers perfect, densely arranged in spirals, tepals 4, cucullate at apex and usually overtopping pistils; stamens 4; pollen globose, forate or rarely (sect. *Polyphyllium*) inaperturate, the exine basically reticulate; ovary 2-locular, with 1 or 2 ovules per cell, rarely 3 or more; fruit a berry.

Anthurium sect. **Pachyneurium** Schott, Prodr. 466. 1860. *Pothos crenata* L. Sp. Pl. Ed. 2: 1373. 1763. TYPE SPECIES: *Anthurium crenatum* (L.) Kunth, Enum. Pl. 3: 75. 1841.

grex *Oxycarpium* Schott, Prodr. 450–451. 1860. TYPE SPECIES: *Anthurium oxycarpum* Poeppig in Poeppig & Endl. Nov. Gen & Sp. 3: 83. T. 293.f.B. 1845

Epiphytic, terrestrial or lithophytic herbs, often large; stems usually short, with short internodes; roots numerous, usually dense; cataphylls usually straight, lanceolate, rarely hooked or cucullate, usually quickly weathering and persisting as fibers. *Leaves* rosulate; petioles mostly short and about ⅓ or less as long as blades, sometimes elongate but rarely as long as blades, stiff to flexible, weakly sheathed near base, rarely throughout much of length, geniculate at apex, the cross-sectional shape various, often D-shaped, rarely terete, sometimes with ribs abaxially, often broadly sulcate with raised margins and sometimes also a medial rib adaxially; blades coriaceous to subcoriaceous, rarely thinner, mostly oblanceolate to elliptic, rarely subcordate to cordate or with conspicuous posterior lobes. *Inflorescence* erect to pendent; peduncle usually terete, short to elongate; spathe usually spreading to reflexed, sometimes recurled, rarely erect or hooding spadix, green, sometimes tinged purple or reddish (especially adaxially); spadix tapered to cylindroid, rarely clavate, usually sessile, green to purplish or reddish, sometimes whitish; flowers truncate and rhombic to square in outline at apex; tepals usually matte to weakly glossy, sometimes with nectar droplets, the outer margin 2–4-sided, the inner margin mostly broadly rounded; stigma sessile, slitlike, lined with papillae, or sometimes brushlike; stamens with filaments rarely exserted, anthers usually clustered around and held tightly over the pistils, rarely long-exserted; pollen yellow or orange, rarely purplish at anther-dehiscence, quickly fading to pale yellow or white. *Infructescence* mostly pendent, occasionally erect; berries mostly obovoid, sometimes somewhat ellipsoid, acute to rounded or truncate at apex, exserted and held by tepalar threads at maturity, variously colored, mostly purplish, red, or orange, rarely yellow or white, 1–2-seeded; mesocarp usually gelatinous, rarely pulpy; seeds mostly oblong-elliptic, usually with a gelatinous appendage.

KEY TO SERIES OF *ANTHURIUM* SECTION *PACHYNEURIUM*

Blades usually oblanceolate to oblanceolate-elliptic, rarely oblong-elliptic or ovate to ovate-cordate, usually drying brown, reddish brown, greenish brown, or blackened, rarely greenish or yellowish green; primary lateral veins usually widely spaced and stout (generally more than 3 cm apart), much more conspicuous than the interprimary veins (the latter usually lacking); fruits usually red or purple to purplish in South America, often orange in Costa Rica and Panama; found throughout the range of the section .... series *Pachyneurium*

Blades usually oblong-elliptic to oblong-oblanceolate or elliptic, rarely oblanceolate, usually drying green to yellow-green; primary lateral veins usually moderately weak, usually closely spaced (generally less than 3 cm apart); interprimary veins usually many, these almost as conspicuous as the primary lateral veins; fruits mostly orange, sometimes purple; mostly endemic to Ecuador, also Nariño, Colombia to Bolivia .... series *Multinervia*

Anthurium series **Pachyneurium** (Schott) Croat, comb. nov. *Anthurium* grex *Pachyneurium* Schott Prodr. 466. 1860.

Anthurium series **Multinervia** Croat, ser. nov. TYPE: *Anthurium napaeum* Engl.

Differt a serie *Pachyneurium* laminae in sicco viridibus cum nervis primaries lateralibus vix conspicuioribus nervis interprimaries.

For an indication of species in series *Multinervia* see the species preceded by an asterisk in Appendix 3.

Key to Species of *Anthurium* Section *Pachyneurium*

1a. Species of Mexico, Central America, Panama, and West Indies.

2a. Blades ovate to narrowly ovate or oblong-ovate, sagittate to cordate, subcordate or hastate at base; mostly less than 2× longer than wide (to 3× longer than wide in *A. selloum* from West Indies); the posterior lobes usually more than ¼ as long as the anterior lobes.

3a. Spadix with pistils early emergent, well above the tepals at anthesis, giving the spadix a rough appearance; stamens often long-exserted and remaining exserted after anthesis.

4a. Blades truncate to subcordate at base, the posterior lobes about as long as wide; spathe margin markedly undulate; Central Panama; 0–1,150 m .... *A. colonicum* K. Krause

4b. Blades deeply cordate-sagittate to hastate at base, the posterior lobes 1.5–3.0× longer than wide; spathe with margins ± flat and straight; Costa Rica to Colombia; 0–2,400 m .... *A. watermaliense* hort. ex Bailey & Nash

3b. Spadix with pistils held mostly below tepals at anthesis; stamens scarcely exserted and retracted to level of tepals after anthesis.

5a. Blades with collective veins arising from one of the basal veins (rarely from one of the lowermost primary lateral veins).

6a. Blades with the basal veins all free to the base; sinus narrowly triangular to closed; less than 300 m.

7a. Blades 44–100 cm long; primary lateral veins 9–20 pairs; southeastern Costa Rica; less than 100 m .... *A. schottianum* Croat & R. A. Baker

7b. Blades 17–46 cm long; primary lateral veins 5–9 pairs Cuba; less than 300 m .... *A. venosum* Griseb.

6b. Blades coriaceous, at least the lowermost pairs of basal veins coalesced to form a marginal posterior rib; sinus arcuate to parabolic or obovate to clavate; Costa Rica and Panama; above 500 m or St. John, Virgin Islands, at less than 300 m.

8a. Blades with 4–9 pairs of primary lateral veins; berries not early emergent, rounded at apex.

9a. Inflorescence nodding before anthesis; spathe hooding spadix at anthesis; spadix cylindrical less than 6× longer than broad .... *A. ranchoanum* Engl.

9b. Inflorescence erect before anthesis; spathe spreading-recurved, never hooding spadix at anthesis; spadix markedly tapered, 10–20× longer than broad; 600–1,850 m .... *A. cotobrusii* Croat & R. A. Baker

8b. Blades with 19–25 pairs of primary lateral veins; berries early emergent, acute at apex .... *A. nervatum* Croat

5b. Blades with collective veins arising from one of the primary lateral veins in the upper ½ of the blade.

10a. Blades prominently lobed at base, the sinus hippocrepiform or spathulate to obovate with the lobes sometimes overlapping; Costa Rica and Panama.

11a. Blades usually less than 50 cm long, broadest at or near the base; sinus arcuate to parabolic or hippocrepiform; spadix usually less than 20× longer than broad; Costa Rica to Panama; 600–1,850 m .... *A. cotobrusii* Croat & R. A. Baker

11b. Blades usually more than 50 cm long, broadest at point of petiole attachment; sinus clavate to obovate; spadix usually more than 20× as long as broad; Costa Rica; 200–1,600 m .... *A. standleyi* Croat & R. A. Baker

10b. Blades merely subcordate to almost truncate at base (rarely more deeply lobed); sinus triangular arcuate to arcuate with decurrent petiole, (rarely subparabolic in *A. selloum*), lobes never even approaching overlap; West Indies (St. John, Virgin Islands); less than 300 m .... *A. selloum* K. Koch

2b. Blades elongate, mostly 3 or more × longer than wide, mostly oblong-elliptic to obovate or oblanceolate, only rarely subcordate at base (if so, the posterior lobes less than 1/10 as long as anterior lobes).

12a. Collective veins arising from the lower ¼ of the blade, often from near the base.

13a. Spadix purplish or brownish at anthesis.

14a. Primary lateral veins prominently sunken above, prominently raised beneath.

15a. Petioles subquadrangular, 3–5-ribbed adaxially; Panama and Costa Rica in Cordillera de Talamanca; 1,300–2,000 m .... *A. seibertii* Croat & R. A. Baker

15b. Petioles terete or subterete, rounded or bluntly angulate adaxially.

16a. Blades more than 83 cm long; spadix 30–75× longer than broad, to 60 cm long, the fruiting spadix more than 30 cm long; Atlantic slope of Costa Rica and in western Panama; 200–600 m .... *A. prolatum* Croat & R. A. Baker

16b. Blades less than 80 cm long; spadix less than 20× longer than broad at anthesis, to 20 cm long, the fruiting spadix usually less than 25 cm long; above 900 m.

17a. Leaf blades usually more than 50 cm long, usually ± pendent; spathe oblong-lanceolate to lanceolate; spadix usually more than 9 cm long; Costa Rica and Panama; 635–2,700 m .... *A. protensum* Schott subsp. *protensum*
17b. Leaf blades usually less than 50 cm long; usually erect; spathe ovate to broadly lanceolate; spadix usually less than 6.5 cm long; mostly western Panama; 1,100–2,000 m .... *A. protensum* Schott subsp. *arcuatum* Croat
14b. Primary lateral veins and collective veins not prominently sunken above, slightly raised beneath.
18a. Blades oblong, broadest midway; primary lateral veins 13–16 pairs, drying inconspicuous, scarcely more conspicuous than interprimary veins; petioles terete; spathe ovate to ovate-elliptic, hooding spadix; Cordillera Tilarán and Cordillera Central in northern Costa Rica .... *A. brenesii* Croat & R. A. Baker
18b. Blades oblanceolate to oblong-oblanceolate, broadest well above middle; primary lateral veins 9–14 pairs, conspicuous, much more prominent than the interprimary veins; petioles subquadrangular to trapezoidal; spathe lanceolate, spreading, not hooding spadix; western Mexico .... *A. schlechtendalii* Kunth subsp. *jimenezii* (Matuda) Croat
13b. Spadix greenish to green or whitish at anthesis.
19a. Petiole with geniculum situated at least 7 cm below base of blade; Pacific slope of southwestern Costa Rica; 300–1,300 m . *A. oerstedianum* Schott
19b. Petiole with geniculum immediately subtending leaf blade.
20a. Plants pendent epiphytes; blades usually more than 1 m long and 25 cm wide.
21a. Petioles subterete, rarely bluntly 4-sided; blades 6–8× longer than wide, matte to semiglossy on upper surface; western Panama; 1,250–1,500 m .... *A pseudospectabile* Croat
21b. Petioles sharply quadrangular; blades 2.5–4× longer than wide, semiglossy to glossy on upper surface; Nicaragua and Costa Rica; 300–1,300 m .... *A. spectabile* Schott
20b. Plants erect, epiphytic or terrestrial; blades usually less than 80 cm long and less than 14 cm wide (sometimes wider in *A. jimenezii* from Pacific slope of Mexico).
22a. Spadix long-tapered, greenish; petioles less than 7 cm long, rounded abaxially; endemic to Central Mexico in Oaxaca on Atlantic slope; 200–1,200 m .... *A. machetioides* Matuda
22b. Spadix oblong to clavate, scarcely or not at all tapered, cream to white or pale yellow; petioles more than 7 cm long, rounded to 3-ribbed abaxially; Nicaragua and Costa Rica.
23a. Petioles longer than the blades; spathe dark reddish purple, nearly round, ca. 7 cm wide; western Panama; 1,675 m .... *A. hammelii* Croat
23b. Petioles $\frac{1}{5}$–$\frac{1}{8}$ as long as blades; spathe green, at most lanceolate-ovate, less than 3 cm wide; Nicaragua to Panama; 0–1,600 m.
24a. Cataphylls persisting intact; petioles rounded to 3-ribbed abaxially; blades with raphide cells visible (at least when dried); primary lateral veins 10–12 pairs, weakly sunken on upper surface; spathe lanceolate-ovate, reflexed; spadix creamy white, cylindroid to clavate, not tapered toward apex, held at ca. 90° angle to peduncle; Pacific slope of southwestern Costa Rica; 0–1,600 m .... *A. eximium* Engl.
24b. Cataphylls weathering to fibers; petioles triangular or sharply 3–5-ribbed abaxially; blades with raphide cells not visible; primary lateral veins 20–30 pairs, prominently sunken on upper surface; spathe lanceolate to broadly lanceolate, erect and cucullate; spadix pale yellow to creamy white, erect or suberect, slightly tapered toward apex, held at ca. 180° angle to peduncle; Nicaragua to Panama; 0–380 m .... *A. spathiphyllum* N. E. Br.
12b. Collective veins arising from the upper ¾ of the blade, mostly from above the middle or lacking.
25a. Spadix purplish or rarely reddish at anthesis (mostly lavender to violet-purple).
26a. Blades with reticulate veins prominulous on both surfaces even when fresh, drying prominently raised; West Indies (Dominican Republic, Puerto Rico, and Virgin Islands) .... *A. crenatum* (L.) Kunth
26b. Blades with reticulate veins on fresh leaves either obscure or sunken above, flat to weakly raised below, drying weakly raised; Central America and northern South America (*A. cubense* also from Cuba).
27a. Peduncle usually shorter than petiole, never more than twice as long as petiole, usually less than twice as long as spadix (rarely somewhat more than twice as long as spadix).

28a. Petioles sharply to bluntly quadrangular or D-shaped, rounded or usually 1–3-ribbed abaxially, spadix dark violet-purple at anthesis; Panama, Atlantic Coast to Continental Divide in wetter parts of tropical moist forest and premontane wet forest, sea level to 1,500 m ..... *A. purpureospathum* Croat

28b. Petioles subterete to obscurely quadrangular, usually rounded adaxially; spadix whitish to lavender at anthesis; Cuba, Yucatán to Panama, Colombia, and Venezuela in tropical dry forest and drier parts of tropical moist and premontane wet forest life zones; 100–700 m ..... *A. cubense* Engl.

27b. Peduncle mostly 2 or more × longer than petiole, usually 2 or more × longer than spadix.

29a. Petioles either subquandrangular in cross section, or 3- or more-ribbed abaxially or both.

30a. Petiole lacking abaxial ribs, eastern Costa Rica and western Panama; 1,200–2,300 m ..... *A. validifolium* K. Krause

30b. Petiole with abaxial ribs.

31a. Spathe dark purple, coriaceous, cucullate and hooding spadix at anthesis; spadix broadest at about lower ⅓; Panama, tropical wet and premontane rainforest life zones; 530–1,350 m ..... *A. luteynii* Croat

31b. Spathe green (sometimes tinged purplish) reflexed, never hooding spadix.

32a. Spadix cylindrical, 7–20× longer than broad at anthesis; tepals bearing conspicuous droplets over their surface at anthesis; spathe oblong-ovate to oblong-elliptic, usually less than 4× longer than broad at anthesis; blades drying brown; Atlantic Coast of Panama to Colombia; less than 100 m ..... *A. concolor* K. Krause

32b. Spadix long-tapered, usually more than 20× longer than broad at anthesis; tepals lacking droplets (except in *A. upalaense* after 2 or more stamens have emerged); spathes mostly lanceolate, 5 or more × longer than broad at anthesis.

33a. Petioles subquandrangular, prominently 3–5-ribbed abaxially; blades acute at base, drying brown to gray-green on lower surface; cataphylls coriaceous, persisting intact; spathe moderately thick, persisting intact; Atlantic slope of Nicaragua and Costa Rica; mostly 0–700 m (rarely to 1,300 m ..... *A. upalaense* Croat & R. A. Baker

33b. Petioles D-shaped, rounded to subtriangular, weakly 1–5-ribbed adaxially; blades usually obtuse to rounded at base; drying pale yellowish green on lower surface; cataphylls moderately thin, soon weathering to semi-intact condition or to fibers or deciduous; spathe thin, soon drying and weathering; principally northern South America but extending into Central Panama; mostly 0–1,000 m ..... *A. fendleri* Schott

29b. Petioles more or less D-shaped in cross section, rounded and unribbed abaxially.

34a. Spadix subcylindroid, less than 10 cm long; pistils sharply pointed, early emergent; tepals greenish white, turning pinkish tan ..... *A. consobrinum* Schott

34b. Spadix long-tapered, greater than 10 cm; pistils rounded at apex, not at all early emergent; tepals maroon or green, soon lavender.

35a. Spadix dark maroon, not at all glaucous; cataphylls lanceolate, the young leaves emerging straight from cataphyll, lacking circinnate vernation (not rolled lengthwise); berries purplish, sometimes white at base; Trinidad, northeastern South America to Brazil (Amapá) ..... *A. jenmanii* Engl.

35b. Spadix pale green when young, soon lavender, weakly glaucous; cataphylls cucullate, fist-shaped, the leaves unrolling lengthwise; berries red; Mexico to Colombia; 0–1,600 m ..... *A. salviniae* Hemsley

25b. Spadix green, greenish, white, yellow, or yellow-green at anthesis.

36a. Petioles subquadrangular or trapezoidal in cross section.

37a. Spathe narrowly to broadly ovate to elliptic, less than 3.5× longer than broad, held erect, enshrouding or hooding spadix (except for *A. halmoorei*).

38a. Spadix clavate, broadest somewhat above the middle, directed at ca. 90° angle from peduncle; spathe boat-shaped and hooding the spadix at anthesis; berries greenish yellow to white; petioles sharply quadrangular with raised edges, usually sharply 3-angular abaxially; Atlantic slope, Nicaragua to Panama; 0–450 m, rarely to 800 m ..... *A. bradeanum* Croat & Grayum

38b. Spadix tapered toward the apex, broadest at the base, held erect or suberect; spathe spreading or erect and enshrouding (but not hooding) spadix at anthesis; berries yellow or red; petioles bluntly quadrangular.
  39a. Spathe stiffly erect and enshrouding spadix; berries orange-red; El Salvador and Guatemala; Pacific slope; 500–800 m .... *A. salvadorense* Croat
  39b. Spathe spreading, never enshrouding spadix; berries pale yellow; western Mexico, Nayarit, Jalisco, and Michoacán; 450–1,000 m .... *A. halmoorei* Croat
37b. Spathe lanceolate to narrowly triangular, usually more than 3.5× longer than wide (sometimes to 3× longer than wide for *A. nizandense*).
  40a. Blades elliptic to obovate-elliptic, less than 3× longer than wide, widest at about the middle; roots mostly thick, to 1 cm diam.; Pacific slope of Mexico (Guerrero and Oaxaca); to 850 m .... *A. nizandense* Matuda
  40b. Blades oblanceolate to obovate, usually more than 3.5× longer than wide, always widest above the middle; roots thick or slender, 2–8 mm diam.
    41a. Cataphylls promptly weathering to fibers; petioles either sharply trapezoidal and more than 1.5 cm diam. or subquadrangular with 3 sharp adaxial ribs and less than 9 mm diam.
      42a. Plants terrestrial; petioles subquadrangular, less than 9 mm diam.; blades moderately thin, long-attenuate at base; primary lateral veins 8–12 pairs; spathe thin, green, linear-lanceolate, spreading-reflexed to spreading (remaining flat, never strongly reflexed); spadix less than 8 mm diam.; Costa Rica and Panama; 0–900 m .... *A. acutifolium* Engl.
      42b. Plants epiphytic or sometimes on rocks; petioles usually trapezoidal, mostly more than 10 mm diam.; blades moderately coriaceous, acute to obtuse at base; primary lateral veins usually more than 12 pairs; spathe coriaceous, often heavily tinged purple, usually narrowly triangular, usually strongly reflexed (the margins rolled under in age); spadix usually more than 1.5 cm diam.; Atlantic slope, Mexico to Honduras; sea level to usually less than 1,000 m .... *A. schlechtendalii* Kunth subsp. *schlechtendalii*
    41b. Cataphylls persisting mostly intact; petioles bluntly quadrangular to subquadrangular, sometimes bluntly 3-ribbed adaxially.
      43a. Petioles prominently 3-ribbed abaxially; cataphylls persisting intact, conspicuous, only rarely weathered; Nicaragua to Costa Rica; sea level to 600 m .... *A. upalaense* Croat & R. A. Baker
      43b. Petioles not prominently ribbed abaxially; cataphylls thin, often weathered to reticulate fibers in part.
        44a. Spadix bluntly tapered, more than 17 mm diam. at base; roots ascending to descending, greenish to tan, 3–8 mm diam.; fruits bright red; Mexico to Nicaragua; 0–1,600 m .... *A. schlechtendalii* Kunth
        44b. Spadix long-tapered, less than 10 mm diam. at base; roots mostly directed upward, whitish, ca. 1 mm diam.; fruits cream to greenish yellow or pale orange; Costa Rica to Panama; 0–1,200 m .... *A. fatoense* K. Krause
36b. Petioles ± D-shaped to subterete in cross section (sometimes bluntly 4-sided in *A. pseudospectabile*).
  45a. Plants pendent; primary lateral veins more than 30 pairs; premontane wet or premontane rainforest life zones, western Panama; 1,250–1,500 m .... *A pseudospectabile* Croat
  45b. Plants with leaves erect, rosulate; primary lateral veins less than 15 pairs.
    46a. Peduncle mostly shorter than petioles, rarely more than twice as long as spadix; spadix cylindroid; tropical dry forest or drier parts of tropical moist forest life zones .... *A. cubense* Engl.
    46b. Peduncles usually much longer than petioles, always more than twice as long as the spadix; spadix long-tapered toward apex.
      47a. Blades elliptic to narrowly elliptic, broadest at about the middle, less than 3× longer than wide.
        48a. Blades usually more than 15 cm wide, drying brown to greenish brown and moderately coriaceous; spathe more than 2.5 cm wide; spadix green becoming reddish brown; Mexico (Guerrero and Oaxaca); to 850 m .... *A. nizandense* Matuda
        48b. Blades less than 15 cm wide, drying pale yellow-green, thin; spathe 1 cm wide or less; spadix yellow; Costa Rica; 300–400 m .... *A. acutifolium* Engl. var. *herrerae* Croat
      47b. Blades oblanceolate to obovate, broadest above the middle, more than 3.5× longer than wide.
        49a. Inflorescence erect; spathe ovate to broadly ovate, less than 3× longer than wide; cataphylls lanceolate; fruits pale yellow or unknown; western Mexico.

50a. Spathe erect, usually dark purple on inside, less than 6 cm long; spadix clavate, broadest near the apex; fruits unknown; endemic to Michoacán; near sea level .... *A. sarukhanianum* Croat & Haager

50b. Spathe spreading, green, at most tinged with purple on inside, more than 13 cm long; spadix tapered toward apex, broadest at or near the base; fruits yellow, greenish at tip; Nayarit, Jalisco and Michoacán; 450–1,000 m .... *A. halmoorei* Croat

49b. Inflorescence usually pendent; spathe lanceolate-linear, more than 5 × longer than wide; cataphylls cucullate, fist-shaped; fruits red; Mexico to Colombia; 0–1,400 m .... *A. salviniae* Hemsley

1b. Species of South America.

51a. Collective vein arising from the base or at least below the middle of the leaf blade.

52a. Spadix greenish or whitish at anthesis.

53a. Spadix bluish green and appearing glaucous at anthesis.

54a. Spadix 14–33 cm long; leaf blades drying coriaceous; central Colombia; 500–2,100 m .... *A. glaucospadix* Croat

54b. Spadix 4–8.5 cm long; leaf blades drying thin; widespread in western Amazonia; 100–870 m .... *A. oxycarpum* Poeppig

53b. Spadix not bluish green or glaucous at anthesis.

55a. Primary lateral veins prominently and sharply raised on upper surface (even when fresh); eastern slopes of Andes in Ecuador and northern Peru; 1,000–2,500 m .... *A. penningtonii* Croat

55b. Primary lateral veins not prominently and sharply raised on upper surface.

56a. Primary lateral veins toward base of leaf blade perpendicular to midrib to retrorse to 130° angle; central Peru; 500–1,800 m .... *A. latissimum* Engl.

56b. Primary lateral veins all ascending.

57a. Petioles mostly 2–10-ribbed abaxially.

58a. Spadix stipitate 5.5–7 cm; leaf blades drying thin; western slopes of Andes in Ecuador; 510–690 m .... *A. bucayanum* Croat

58b. Spadix sessile or subsessile; leaf blades drying subcoriaceous to coriaceous.

59a. Primary lateral veins fewer than 15 per side; cataphylls hooked; central Colombia; 900–1,750 m .... *A. caucavallense* Croat

59b. Primary lateral veins more than 15 per side; cataphylls straight; western slopes of Andes in Ecuador.

60a. Leaf blades less than 20 cm wide; peduncle less than 40 cm long; spadix less than 10 cm long; western Loja; 1,400–2,700 m .... *A. lennartii* Croat

60b. Leaf blades more than 20 cm wide; peduncle more than 40 cm long; spadix more than 10 cm long; Bolívar and Chimborazo; 1,200–2,150 m .... *A. campii* Croat

57b. Petioles mostly rounded or only 1-angled abaxially.

61a. Spadix deflexed to reflexed, held at 130–160° angle from peduncle; western slopes of Andes in Ecuador; 300–400 m .... *A. oxyphyllum* Sodiro

61b. Spadix not deflexed or reflexed, held ± 180° from peduncle.

62a. Species of the Amazon basin and drainage system.

63a. Leaf blades broadly elliptic to broadly elliptic with flat margins; Peru (San Martín) or Venezuela (Amazonas).

64a. Blades epunctate on lower surface; collective veins arising from the base of the blade; San Martín, Peru; 400–500 m .... *A. knappiae* Croat

64b. Blades conspicuously glandular-punctate on the lower surface; collective veins lacking or arising from the uppermost primary lateral veins. 420 m .... *A. vinillense* Bunting

63b. Leaf mostly oblanceolate, with conspicuously undulate margins.

65a. Primary lateral veins fewer than 10 per side; San Martín, Peru; 130–750 m .... *A. llewelynii* Croat

65b. Primary lateral veins more than 10 per side; Ecuador to southern Peru; 950–2,750 m .... *A. dombeyanum* Brongn. ex Schott

62b. Species occurring on western slopes of Andes in Ecuador.
66a. Peduncle more than 3 × longer than peduncles; El Oro and Cotopaxi; 2,100–2,500 m .... *A. angustilaminatum* Engl. subsp. *cibuserpentis* Croat
66b. Peduncle less than 3 × longer than petioles.
67a. Petioles sharply triangular-winged; blades markedly long-attenuate in lower half; terrestrial; 80–400 m .... *A. palenquense* Croat
67b. Petioles subterete to D-shaped; blades acute or at most abruptly attenuate at base, not markedly long-attenuate in lower half of blade; usually epiphytic.
68a. Blades mostly more than 15 cm wide, less than 7 × longer than wide; central and northern Ecuador; 250–1,500 m .... *A. holmnielsenii* Croat
68b. Blades less than 15 cm wide, more than 7 × longer than wide.
69a. Blades usually pendent, matte and velvety on the upper surface; petioles terete to subterete; Los Ríos and Pichincha; 650–1,200 m .... *A. acutissimum* Engl.
69b. Blades stiffly erect-spreading, usually semiglossy on upper surface; petioles sharply D-shaped; widespread in western Ecuador; 50–1,330 (2,000) m .... *A. obscurinervium* Croat
52b. Spadix reddish or purplish at anthesis.
70a. Species of the Amazon basin and drainage system.
71a. Spadix longer than peduncle; La Paz, Bolivia; 1,000–1,400 m .... *A. solomonii* Croat
71b. Spadix shorter than peduncle.
72a. Leaf blades with primary lateral veins mostly more than 15 per side; occurring mostly above 800 m (origin of *A. martianum* unknown).
73a. Leaf blades less than 10 cm wide.
74a. Blades less than 2.5 × longer than the petioles; cataphylls persisting intact to semi-intact; Peru and Bolivia; 890–1,700 m .... *A. ottonis* K. Krause
74b. Blades more than 2.5 × longer than the petioles; cataphylls persisting at a reticulum of pale fibers.
75a. Petioles subtriangular; spadix with 5–7 flowers visible per spiral; dried pistils protruding well above the tepals, blackened with pale raphide cells visible; southern Ecuador to Bolivia; 2,200–2,400 m .... *A. soukupii* Croat
75b. Petioles D-shaped; spadix with 8–11 flowers visible per spiral; dried pistils rounded at apex and not emerging above tepals, yellow-brown and lacking raphide cells; eastern slopes of the Andes in Ecuador (Tunguragua, Pastaza and Morona Santiago); 970–1,600 m .... *A. fasciale* Sodiro
73b. Leaf blades more than 10 cm wide.
76a. Leaf blades more than 20 cm wide.
77a. Primary lateral veins more than 25 per side; petioles triangular, acutely angled abaxially; eastern slopes of Andes in Ecuador; 600–1,830 m .... *A. santiagoense* Croat
77b. Primary lateral veins fewer than 25 per side; petioles mostly D-shaped, rounded abaxially.
78a. Leaf blades about as long as or scarcely longer than the petioles; blades broadest at or below the middle; peduncle less than 2 × longer than petiole; origin unknown, said to be from the Guianas .... *A. martianum* K. Koch & Kolb
78b. Leaf blades much longer than the petioles; blades broadest above the middle (rarely near the middle); peduncle more than 2 × longer than petiole; Ecuador to southern Peru; (370)950–2,760 m .... *A. dombeyanum* Brongn. ex Schott
76b. Leaf blades mostly less than 20 cm wide.
79a. Leaf blades conspicuously quilted (i.e., with the leaf tissue conspicuously raised between the primary lateral veins), with primary lateral veins ascending and then spreading retrorsely at 30–70° angle; Huánuco, Peru; 650–800 m .... *A. reflexinervium* Croat
79b. Leaf blades not quilted, with primary lateral veins all ascending.

80a. Primary veins prominently and sharply raised on upper surface (even on drying); eastern slopes of Andes in Ecuador and northern Peru; (800)1,000–2,500 m ..... *A. penningtonii* Croat

80b. Primary lateral veins not prominently and sharply raised on upper surface.

81a. Leaf blades oblong; peduncle less than 3× longer than petiole; eastern slopes of Andes in Ecuador; 970–1,600 m ..... *A. fasciale* Sodiro

81b. Leaf blades mostly oblanceolate; peduncle more than 3× longer than petiole; Ecuador to southern Peru; 950–2,760 m ..... *A. dombeyanum* Brongn. ex Schott

72b. Leaf blades with primary lateral veins 15 or fewer per side; occurring mostly below 800 m.

82a. Leaf blades with primary lateral veins toward base perpendicular to midrib to retrorse; central Peru; 500–1,800 m ..... *A. latissimum* Engl.

82b. Leaf blades with primary lateral veins all ascending.

83a. Leaf blades over 4× longer than broad or ≤2× longer than broad.

84a. Leaves spreading-pendent; blades oblong to oblanceolate, over 4× longer than broad; Ecuador and adjacent Peru and Colombia; 90–550 m ..... *A. pendulifolium* N. E. Br.

84b. Leaves erect or spreading; blades elliptic to broadly ovate-elliptic or broadly lanceolate, ≤2× longer than broad.

85a. Blades obtuse to rounded or cuneate at base; basal veins usually 1 pair, rarely 2 pairs, merging with the margin in the lower ¼ of the blade; Emma mountains, Surinam; 850 m ..... *A. lanjouwii* Jonker & Jonker

85b. Blades shallowly cordate at base; basal veins 3–4 pairs, at least the uppermost joining the margin well near or above the middle of the blade; Cerro Neblina and Cerro Yapacana, Amazonas, Venezuela; 780–825 m ..... *A. wurdackii* Bunting

83b. Leaf blades mostly between 4 and 2× longer than broad.

86a. Peduncle less than 10 cm long; spadix less than 5 cm long; leaf blades quilted and velvety; known only from Río Sucusari, Loreto, Peru; below 200 m ..... *A. willifordii* Croat

86b. Peduncle more than 10 cm long at anthesis; spadix more than 5 cm long; leaf blades not quilted or velvety.

87a. Geniculum appearing remote from base of blade by 4–11 cm; Amazonas, Brazil ..... *A. krukovii* Croat

87b. Geniculum at base of blade, not appearing remote.

88a. Leaf blades mostly more than 40 cm long; western Amazonia; mostly below 500 m.

89a. Blades usually narrowly to broadly oblanceolate, long-attenuate or rarely acute at base ..... *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat

89b. Blades ovate-elliptic, rounded at base (sometimes acutely decurrent onto petiole) ..... *A. atropurpureum* R. Schultes & Maguire var. *thomasii* Croat

88b. Leaf blades less than 40 cm long.

90a. Leaf blades broadest near middle, drying pale green; tertiary veins etched on upper surface when fresh; northwestern Amazonia; below 160 m.

91a. Blades drying pale gray-green, less than 14 cm wide, usually less than 12 cm wide, narrowly acute or at least prominently decurrent at base; the spathe inserted at ca. 90° angle on peduncle; western margin of Amazon basin in Acre, Brazil, and Loreto, Peru; 120–160 m ..... *A. atropurpureum* R. Schultes & Maguire var. *atropurpureum*

91b. Blades drying dark yellow-green to yellow-brown, more than 12 cm, (usually more than 14 cm) wide, usually obtuse to rounded at base, never narrowly acute or decurrent at base; spathe inserted at ca. 45° angle on peduncle; Surinam; 850 m ..... *A. lanjouwii* Jonker & Jonker

90b. Leaf blades broadest below middle, drying dark, mostly brown; tertiary veins not etched on upper surface; known only from near Tarapoto, San Martín, Peru ..... *A. basirotundum* Croat

70b. Species of northern and central and Pacific coastal Colombia, western slopes of Andes in Ecuador and northern coastal Peru or eastern coastal Brazil, not occurring in the Amazon basin or drainage system.
  92a. Leaf blades usually less than 15 cm wide.
    93a. Primary lateral veins near middle of leaf blade more than 2 cm apart.
      94a. Terrestrial; leaf blades oblong-linear, less than 7 cm wide; coastal Ecuador ..... *A. linquifolium* Engl.
      94b. Epiphytic; leaf blades oblong-oblanceolate, more than 7 cm wide; Tumbes, Peru; 600–800 m ..... *A. simpsonii* Croat
    93b. Primary lateral veins at middle of leaf blade mostly less than 2 cm apart.
      95a. Primary lateral veins sharply raised on upper surface (even when fresh); western slopes of Andes in Ecuador; 2,000–3,000 m ..... *A. pallatangense* Engl.
      95b. Primary lateral veins not sharply raised on upper surface.
        96a. Leaf blades with margins conspicuously concave toward base; western slopes of Andes in Ecuador; 150–300 m ..... *A. palenquense* Croat
        96b. Leaf blades with margins straight or convex toward base.
          97a. Petioles sharply triangular, mostly more than 16 cm long; western slopes of Andes in Ecuador; 200–1,300 m ..... *A. napaeum* Engl.
          97b. Petioles D-shaped, subterete or obscurely triangular, mostly less than 16 cm long.
            98a. Leaf blades truncate to narrowly rounded at base; Ecuador; 2,135–2,500 m ..... *A. angustilaminatum* Engl. subsp. *cibuserpentis* Croat
            98b. Leaf blades acute to attenuate at base.
              99a. Leaf blades mostly more than 50 cm long, 4.5–6.6× longer than petioles; spadix dark purple; Pichincha, Ecuador; ca. 1,200 m ..... *A. angustilaminatum* Engl. subsp. *angustilaminatum*
              99b. Leaf blades mostly less than 50 cm long; 2.5–4.5× longer than petioles; spadix maroon to brownish (orange-brown, brown to brownish purple); Carchí, Ecuador, Nariño, Colombia; 1,200–2,600 m ..... *A. carchiense* Croat
  92b. Leaf blades usually more than 15 cm wide.
    100a. Petioles triangular or terete.
      101a. Petioles terete; spathe 2.5–4.3 cm wide, erect; fruits dirty white to pale violet; southeastern coastal Brazil; 0–250 m ..... *A. coriaceum* G. Don in Sweet
      101b. Petioles triangular; spathe 0.4–2.5 cm wide, reflexed to spreading; fruits dirty white; western slopes of Andes in Ecuador and Colombia.
        102a. Leaf blades with margins conspicuously concave toward base; 80–400 m ..... *A. palenquense* Croat
        102b. Leaf blades with margins straight or convex toward base; 200–1,300 m ..... *A. napaeum* Engl.
    100b. Petioles usually D-shaped.
      103a. Primary lateral veins fewer than 20 per side.
        104a. Fruits orange; roots glabrous and minutely but conspicuously warty; cataphylls straight; Magdalena, Colombia, near Minca ..... *A. johnsoniae* Croat
        104b. Fruits violet-purple; roots pubescent, not warty; cataphylls hooked; central Colombia; 900–1,750 m ..... *A. caucavallense* Croat
      103b. Primary lateral veins 20 or more per side.
        105a. Leaf blades rounded to truncate at base, about as long as petiole or rarely twice as long; origin unknown ..... *A. martianum* K. Koch & Kolb
        105b. Leaf blades acute to attenuate at base, 2–8× longer than petiole.
          106a. Spadix purplish brown, stipitate 2.5–3 cm; Manabí, Ecuador; 450 m ..... *A. manabianum* Croat
          106b. Spadix dark purple to reddish violet, subsessile.
            107a. Spadix more than 30× longer than thick; leaf blades long-attenuate at base; Nariño, Colombia; 900–1,000 m ..... *A. narinoense* Croat

107b. Spadix less than 30× longer than thick; leaf blades acute to obtuse or cuneate at base; Ecuador; 210–250 m .... *A. sparreorum* Croat

51b. Collective vein arising from above or near middle of leaf blade or absent.

108a. Spadix red, reddish, maroon, or purplish to violet-purple.

109a. Peduncle less than 5× longer than petiole.

110a. Species of Amazon basin and drainage system (Brazilian highlands, Bolivia, Paraguay, Argentina).

111a. Leaf blades ≤3× longer than broad.

112a. Petioles mostly subterete in cross section.

113a. Leaf blades subcordate at base, thickly coriaceous; peduncle more than 50 cm long.

114a. Leaf blade stipitate, the midrib naked beyond the base of the blade for a distance of up to 5 cm before reaching the geniculum (the geniculum appearing remote), or the blade at least decurrent and the lowermost primary lateral veins naked at base for 1.5–2 cm; Venezuela, Amazonas; 10–150 m .... *A. guanchezii* Bunting

114b. Leaf blade not stipitate at base, the geniculum not appearing remote from the base of the blade.

115a. Blade ovate, 1.5–1.7× longer than wide, dark glandular-punctate on lower surface; spathe decurrent for less than 1 cm; Venezuela, Amazonas; 1,350 m .... *A. iramirezae* Bunting

115b. Blades ovate-elliptic, 1.9–2.2× longer than wide, epunctate; spathe decurrent for 2–7.5 cm; Venezuela, Amazonas; 725–825 m .... *A. wurdackii* Bunting

113b. Leaf blades attenuate to obtuse at base, chartaceous to moderately coriaceous; peduncle less than 50 cm long.

116a. Blades obtuse to rounded or sometimes cuneate at base, never attenuate; Surinam; 850 m .... *A. lanjouwii* Jonker & Jonker

116b. Blades attenuate at base; upper Amazon basin; less than 300 m.

117a. Petioles less than 25 cm long; geniculum at base of leaf blade; Loreto, Peru; 100–160 m .... *A. uleanum* Engl. var. *nanayense* Croat

117b. Petioles more than 25 cm long; geniculum appearing remote from base of leaf blade by 4–20 cm; Acre State, Brazil .... *A. pranceanum* Croat

112b. Petioles variously shaped in cross section but never subterete.

118a. Spadix longer than peduncle; infructescence with apical ca. ⅓ withered; cataphyll fibers fine, hairlike, reddish brown; Peru to Bolivia, Paraguay, and Brazil; 50–900 m .... *A. plowmanii* Croat

118b. Spadix shorter than peduncle; infructescence usually not withered in apical ⅓; cataphyll fibers various, usually not fine and hairlike.

119a. Leaf blade broadest at or below middle, up to 41 cm long; spadix less than 15× longer than thick; known only from vicinity of Tarapoto, San Martín, Peru .... *A. basirotundum* Croat

119b. Leaf blade broadest above the middle, or if broadest near or below middle, then spadix more than 15× longer than thick; leaf blades mostly longer.

120a. Spadix more than 40× longer than thick, 3–4 mm diam. midway (when dried); known only from Colombia (Vaupés, Amazonas) .... *A. vaupesianum* Croat

120b. Spadix less than 40× longer than thick, or if more than 40× longer than thick, then more than 5 mm diam.

121a. Primary lateral veins toward base of leaf blade perpendicular to retrorse to 130° to midrib; central Peru; 500–1,800 m .... *A. latissimum* Engl.

121b. Primary lateral veins all ascending, never retrorse.

122a. Cataphylls hooked or cucullate.

123a. Inflorescence erect-spreading; leaf blades usually matte on upper surface (when fresh); above 400 m (up to 1,800 m) on eastern slopes of Andes in Colombia and Ecuador .... *A. harlingianum* Croat

123b. Inflorescence pendent to spreading-pendent; leaf blades semiglossy on upper surface (when fresh); western and northern Amazonia; below 300 m.
  124a. Peduncle 5–6× longer than petiole, strictly pendent, 3–5 mm diam. at anthesis; Venezuela in Amazonas and Bolívar, northern Pará State in Brazil .... *A. cataniapoense* Croat
  124b. Peduncle 4–12× longer than petiole, spreading to spreading-pendent, 6–11 mm diam. at anthesis; Upper Amazon basin, western Brazil (Amazonas) Peru, Colombia, and Ecuador .... *A. loretense* Croat

122b. Cataphylls straight, lanceolate.
  125a. Leaf blades frequently with glandular punctations and/or pustules (at least abaxially); habit mostly terrestrial or epilithic; widespread in Brazil and Colombia, Venezuela, and the Guianas.
    126a. Spathe usually withered at anthesis.
      127a. Spathe thin, caducous, 5.5–11.5 cm long; western to northeastern Colombia, western Venezuela, Panama; sea level to 1,000 (2,430) m .... *A. fendleri* Schott
      127b. Spathe subcoriaceous, not caducous, 11–50 cm long; Trinidad and Tobago, Venezuela, Guianas, Amapá in Brazil; mostly below 500 m .... *A. jenmanii* Engl.
    126b. Spathe not withered at anthesis.
      128a. Stems erect; northern Amazon basin, rarely south of the Río Amazonas (middle Río Tocantins).
        129a. Leaf blades rounded to subtruncate at base, mostly drying greenish; stipe 15–40 mm long; southeastern Colombia, Amazonas, and Bolívar in Venezuela; 75–380 m .... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat
        129b. Leaf blades attenuate to acute or obtuse at base, usually drying brown or yellowish; stipe lacking or to 20 mm long.
          130a. Leaf blades usually elliptic to broadly elliptic; usually 3–6× longer than petiole; petiole rarely exceeding 30 cm long; southeastern Colombia, southern Venezuela, northwestern Brazil; mostly below 500 m .... *A. bonplandii* Bunting subsp. *bonplandii*
          130b. Leaf blades usually oblanceolate to obovate; usually about twice as long as the petiole; Surinam, southern Venezuela; 400–1,400 m .... *A. bonplandii* Bunting subsp. *guayanum* (Bunting) Croat
      128b. Stem creeping horizontally; Mato Grosso, Goiás, southern Pará and Rondônia in Brazil .... *A. lindmanianum* Engl.
  125b. Leaf blades without glandular punctations or pustules; habit mostly epiphytic; mostly occurring in Peru and Ecuador.

131a. Cataphylls persisting as a skeleton of fine, pale fibers; leaf blades mostly drying green, with primary lateral veins conspicuously orangish.

132a. Inflorescence spreading-pendent; peduncle 23–54 cm long; known only from Pastaza, Ecuador; 300 m .... *A. ernestii* Engl. var. *oellgaardii* Croat

132b. Inflorescence erect; peduncle usually 3–25 cm long; widespread in western Amazonia; below 500 m .... *A. ernestii* Engl. var. *ernestii*

131b. Cataphylls persisting semi-intact and brown, with the fibers relatively inconspicuous; leaf blades mostly drying brown, with primary lateral veins brownish or yellowish.

133a. Primary lateral veins 10–23 per side.

134a. Epiphytic; petioles rounded and unribbed or 3–5-ribbed abaxially; peduncle 21–50 cm long; spadix salmon-pink to pale violet-purple; eastern slopes of Andes in Colombia and Ecuador; 440–1,800 m .... *A. harlingianum* Croat

134b. Terrestrial; petioles 5–8-ribbed abaxially; peduncle 50–91 cm long; spadix dark purple; Imbabura, Ecuador; 900–1,500 m .... *A. leonianum* Sodiro

133b. Primary lateral veins mostly 5–10 per side.

135a. Geniculum appearing remote from base of blade by up to 16 cm; petioles narrowly and obtusely sulcate adaxially with blunt margins; San Martín and Amazonas, Peru; 530–1,160 m .... *A. remotigeniculatum* Croat

135b. Geniculum not appearing remote; petioles convex to broadly sulcate adaxially with sharp margins.

136a. Spadix appearing glaucous, mostly 18–50× longer than broad; Loreto, Peru, and adjacent Colombia, Ecuador, and Brazil; below 550 m .... *A. uleanum* Engl. var. *uleanum*

136b. Spadix not appearing glaucous, 6–18× longer than broad; San Martín, Peru; 360–700 m .... *A. tarapotense* Engl.

111b. Leaf blades usually more than 3× longer than broad.

137a. Primary lateral veins retrorse toward base of leaf blade or throughout its length.

138a. Leaf blades to 18 cm wide, obtuse to shallowly cordate at base, conspicuously quilted, with conspicuously retrorse, arcuate primary lateral veins throughout their length; known only from vicinity of Tingo María (Huánuco), Peru; 650–800 m .... *A. reflexinervium* Croat

138b. Leaf blades to 36.5 cm wide, acute to attenuate at base, weakly bullate at most, with conspicuously retrorse primary lateral veins only toward base of leaf blade; central Peru; 500–1,800 m .... *A. latissimum* Engl.

137b. Primary lateral veins all ascending.

139a. Peduncle more than 3× longer than petiole.

140a. Spadix pale and appearing glaucous.

141a. More than 6 flowers visible in either spiral; western Amazonia; below 550 m .... *A. uleanum* Engl. var. *uleanum*

141b. Fewer than 6 flowers visible in either spiral; Loreto, Peru, 100–160 m .... *A. uleanum* Engl. var. *nanayense* Croat
140b. Spadix usually not pale, not appearing glaucous.
142a. Spathe usually withered at anthesis.
143a. Tertiary veins prominently etched on upper surface when fresh; western Amazonia; 100–560 m .... *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat
143b. Tertiary veins not prominently etched on upper surface when fresh.
144a. Spathe thin, caducous, 5.5–11 cm long; western-central to northeastern Colombia, western Venezuela, Panama; sea level to 1,000(2,430) m .... *A. fendleri* Schott
144b. Spathe subcoriaceous, not caducous, 11–50 cm long; Trinidad and Tobago, Guianas, Amapá in Brazil; mostly below 500 m .... *A. jenmanii* Engl.
142b. Spathe not withered at anthesis.
145a. Cataphylls hook-shaped or cucullate.
146b. Inflorescence erect-spreading; leaf blades usually matte on upper surface (when fresh); lower eastern slopes of Andes in Colombia and Ecuador; 440–1,800 m .... *A. harlingianum* Croat
146b. Inflorescence pendent; leaf blades semiglossy on upper surface (when fresh); in Amazonas and Bolívar, Venezuela, Pará in Brazil; below 300 m .... *A. cataniapoense* Croat
145b. Cataphylls straight, lanceolate.
147a. Leaf blade with tertiary veins conspicuously etched on upper surface when fresh; central Peru; (240)320–770 m .... *A. pachylaminum* Croat
147b. Leaf blade with tertiary veins not conspicuously etched, mostly obscure, when fresh.
148a. Petioles rounded abaxially.
149a. Primary lateral veins 10–21 per side.
150a. Petioles ca. 8 cm long; leaf blades ca. 5.4× longer than broad; known only from the Serranía de Cutucú in Morona-Santiago, Ecuador; 1,300 m .... *A. bushii* Croat
150b. Petioles 10–30 cm long; leaf blades usually less than 5× longer than broad; central Ecuador to southern Peru; 950–2,760 m .... *A. dombeyanum* Brongn. ex Schott
149b. Primary lateral veins 5–10 per side.
151a. Leaf blades rounded to subtruncate at base, mostly drying greenish; stipe 15–40 mm long; southeastern Colombia, Amazonas and Bolívar in Venezuela; 75–380 m .... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat
151b. Leaf blades acute to attenuate at base, mostly drying brown to yellowish; stipe 3–20 mm long; southeastern Colombia, southern Venezuela, northern Brazil; mostly below 500 m .... *A. bonplandii* Bunting subsp. *bonplandii*
148b. Petioles (1)3–5(8)-ribbed abaxially.
152a. Primary lateral veins 10–16 per side.
153a. Peduncle less than 50 cm long; spadix 7–8 cm long; epiphytic; known only from Pastaza, Ecuador; 300 m .... *A. ernestii* Engl. var. *oellgaardii* Croat

153b. Peduncle more than 50 cm long; spadix over 20 cm long; terrestrial; known only from Imbabura, Ecuador; 900–1,500 m .... *A. leonianum* Sodiro

152b. Primary lateral veins 4–10 per side.

154a. Leaf blades subcoriaceous, oblanceolate to oblong-oblanceolate, without glandular punctations; southern Brazil, Bolivia, Paraguay, northern Argentina; 150–1,700 m .... *A. paraguayense* Engl. var. *paraguayense*

154b. Leaf blades mostly coriaceous, mostly elliptic to broadly elliptic, usually with glandular punctations below; southeastern Colombia, southern Venezuela, northern Brazil; mostly below 500 m .... *A. bonplandii* Bunting subsp. *bonplandii*

139b. Peduncle ≤3× longer than petiole.

155a. Spadix pale and appearing glaucous.

156a. Peduncle 2.5–9 cm long; spadix 1.7–4.7 cm long; leaves quilted and velvety; known only from Río Sucusari, Loreto, Peru .... *A. willifordii* Croat

156b. Peduncle 14–38 cm long; spadix 5–15 cm long; leaves not quilted or velvety.

157a. More than 6 flowers visible in either spiral; western Amazonia; below 550 m .... *A. uleanum* Engl. var. *uleanum*

157b. Fewer than 6 flowers visible in either spiral; Loreto, Peru; 100–160 m .... *A. uleanum* Engl. var. *nanayense* Croat

155b. Spadix usually not pale, not appearing glaucous.

158a. Spathe very thin, usually withered at anthesis.

159a. Tertiary veins prominently etched on upper surface when fresh; western Amazonia; below 560 m .... *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat

159b. Tertiary veins not prominently etched on upper surface when fresh; western to northeastern Colombia, western Venezuela, Panama; sea level to 1,000(2,430) m .... *A. fendleri* Schott

158b. Spathe moderately thick, not withered at anthesis.

160a. Spadix longer than peduncle; infructescence with apical ca. ⅓ withered; cataphyll fibers fine, hairlike, reddish brown; Peru to Bolivia, Paraguay and Brazil; 50–900 m .... *A. plowmanii* Croat

160b. Spadix shorter than peduncle, usually much shorter; infructescence usually not withered in apical ⅓; cataphyll fibers various, usually not fine and hairlike.

161a. Leaf blade with tertiary veins conspicuously etched on upper surface when fresh; central Peru; (240)320–770 m .... *A. pachylaminum* Croat

161b. Leaf blade with tertiary veins not conspicuously etched above, mostly obscure when fresh.

162a. Leaves and inflorescence pendent to spreading-pendent; petioles usually more than 30 cm long; spadix more than 20 cm long; Ecuador and adjacent Peru and Colombia; 90–550 m .... *A. pendulifolium* N. E. Br.

162b. Leaves and inflorescence erect to erect-spreading; petioles mostly less than 30 cm long; spadix mostly less than 20 cm long.

163a. Leaf blades usually with conspicuous glandular punctations (at least abaxially).

164a. Leaf blades rounded to subtruncate at base, mostly drying greenish; stipe 15–40 mm long; southeastern Colombia, Amazonas and Bolívar in Venezuela; 75–380 m .... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat

164b. Leaf blades acute to attenuate at base, mostly drying brown or yellowish; stipe 3–20 mm long; southeastern Colombia, southern Venezuela, northern Brazil; mostly below 500 m .... *A. bonplandii* Bunting subsp. *bonplandii*

163b. Leaf blades without glandular punctations.

165a. Cataphylls persisting as an intact network of fine, pale fibers; primary lateral veins usually drying conspicuously orange on lower surface.

166a. Inflorescence spreading-pendent; peduncle more than 20 cm long; known only from Pastaza, Ecuador .... *A. ernestii* Engl. var. *oellgaardii* Croat

166b. Inflorescence erect; peduncle usually less than 20 cm long; widespread in western Amazonia; below 500 m .... *A. ernestii* Engl. var. *ernestii*

165b. Cataphylls persisting semi-intact and brown with usually inconspicuous, mostly coarse fibers; primary lateral veins not drying orange.

167a. Petioles 1–3-ribbed abaxially; southern Brazil, Bolivia, Paraguay, northern Argentina; 150–1,700 m .... *A. paraguayense* Engl. var. *paraguayense*

167b. Petioles rounded abaxially; Brazil, Ecuador, and Peru.

168a. Primary lateral veins 10–20 per side; peduncle 3–7 × longer than petiole; central Ecuador to southern Peru; 950–2,760 m .... *A. dombeyanum* Brongn. ex Schott

168b. Primary lateral veins 6–10 per side; peduncle less than 3 × longer than petiole.

169a. Stem erect; petioles medially 1-ribbed adaxially; epiphytic; known only from Napo, Ecuador; 600 m .... *A. tenaense* Croat

169b. Stem usually horizontal and creeping; petioles flat to slightly sulcate adaxially; terrestrial or epilithic, rarely epiphytic; Brazil in Mato Grosso, Goiás, Pará, Rondônia .... *A. lindmanianum* Engl.

110b. Species of western slopes of Andes, northern Colombia and Venezuela, southeastern coastal Brazil; not occurring in the Amazon basin.

170a. Cataphylls cucullate or hook-shaped.

171a. Cataphylls cucullate.

172a. Blades usually more than 4 × longer than wide, the margins usually sinuate and markedly undulate; petioles usually 1–4-ribbed abaxially; inflorescence usually erect-spreading; spadix reddish to purplish violet, not glaucous; coastal Ecuador and Peru; mostly dry regions, sea level to 890 m .... *A. barclayanum* Engl.

172b. Blades usually less than 4 × longer than wide, the margins not at all sinuate and only weakly undulate; petioles rounded abaxially; inflorescence usually pendent; spadix pale lavender, glaucous; northern Colombia to Nicaragua; humid to wet regions, sea level to 1,600 m .... *A. salviniae* Hemsley

171b. Cataphylls hook-shaped.

173a. Primary lateral veins departing midrib at 70–90° angle; peduncle 1–2× longer than petiole; central Colombia; 900–1,750 m ..... *A. caucavallense* Croat

173b. Primary lateral veins departing midrib at 40–50° angle; peduncle 3–6× longer than petiole; coastal Ecuador; sea level to 400 m ..... *A. asplundii* Croat

170b. Cataphylls straight.

174a. Spathe usually withered at anthesis (at least on dried specimens).

175a. Spathe thin, caducous, 5.5–11 cm long; Panama, western to northeastern Colombia, western Venezuela; sea level to 1,000(2,430) m ..... *A. fendleri* Schott

175b. Spathe subcoriaceous, not caducous, 11–50 cm long; Trinidad and Tobago, Guianas, Amapá in Brazil mostly below 500 m ..... *A. jenmanii* Engl.

174b. Spathe not withered at anthesis.

176a. Primary lateral veins 16–30 per side; leaf blades drying distinctly green; western slopes of Andes in Ecuador.

177a. Petioles broadly triangular; 4–6 flowers visible per spiral; 200–1,300 m ..... *A. napaeum* Engl.

177b. Petioles D- or U-shaped; usually more than 6 flowers visible per spiral.

178a. Petioles 15–38 cm long; leaf blades 46–90 cm long, 10–20 cm wide; Los Ríos and Cotopaxi, Ecuador; 210–250 m ..... *A. sparreorum* Croat

178b. Petioles 7–15 cm long; leaf blades 90–125 cm long, 20–34 cm wide; Esmeraldas, Los Ríos and Pichincha, Ecuador; sea level to 400 m ..... *A. asplundii* Croat

176b. Primary lateral veins 5–17 per side; leaf blades mostly drying brown; northern South America to Central America, Cuba, coastal Brazil.

179a. Petioles C-shaped, narrowly and deeply sulcate with usually blunt margins adaxially, rounded abaxially; Brazil in Minas Gerais, Rio de Janeiro and Espírito Santo ..... *A. solitarium* (Vell. Conc.) Schott

179b. Petioles not C-shaped, usually D-shaped, mostly flattened or shallowly sulcate with sharp margins adaxially, generally flat or 1–several-ribbed abaxially.

180a. Spadix more than 15× longer than thick; northern Venezuela, northwestern Colombia, Curaçao; sea level to 1,800 m ..... *A. crassinervium* (Jacq.) Schott

180b. Spadix less than 15× longer than thick.

181a. Peduncle less than 30 cm long; petioles mostly rounded abaxially; more than 10 flowers visible in either spiral; northern Colombia and Venezuela, Cuba, to Central America ..... *A. cubense* Engl.

181b. Peduncle more than 30 cm long; petioles prominently 3–8-ribbed abaxially; fewer than 10 flowers visible in either spiral; northern Colombia (Chocó) to Panama ..... *A. concolor* K. Krause

109b. Peduncle more than 5× longer than petiole.

182a. Cataphylls hook-shaped or cucullate.

183a. Species occurring in the Amazon basin and on eastern slopes of Andes.

184a. Inflorescence erect-spreading; leaf blades usually matte on upper surface when fresh; on eastern slopes of Andes in Colombia and Ecuador; mostly above 440 m ..... *A. harlingianum* Croat

184b. Inflorescence pendent to spreading-pendent; leaf blades semiglossy on upper surface when fresh; in western and northern Amazonia; below 350 m.

185a. Peduncle 5–6× longer than petiole, 3–4 mm diam.; inflorescence strictly pendent; Amazonas and Bolívar, Venezuela ..... *A. cataniapoense* Croat

185b. Peduncle 4–12× longer than petiole, 6–11 mm diam.; inflorescence spreading to spreading-pendent; upper Amazon basin, Brazil (Amazonas), Loreto, Peru and adjacent Colombia and Ecuador ..... *A. loretense* Croat

183b. Species occurring in northern Colombia and coastal Ecuador.

186a. Cataphylls hook-shaped, lanceolate; sea level to 400 m ...... *A. asplundii* Croat

186b. Cataphylls cucullate.

187a. Spadix pale lavender, glaucous; inflorescence usually pendent; petioles rounded abaxially; leaf blades with slightly undulate margins; northern Colombia to Mexico; humid to wet regions, sea level to 1,600 m ...... *A. salviniae* Hemsley

187b. Spadix reddish to violet-purple not glaucous; inflorescence usually erect-spreading; petioles usually 1–4-ribbed abaxially; leaf blades with usually strongly undulate margins; dry coastal Ecuador; sea level to 890 m ...... *A. barclayanum*

182b. Cataphylls straight, lanceolate.

188a. Leaf blades conspicuously quilted, with primary lateral veins conspicuously retrorse-arcuate; Huánuco, Peru; 650–800 m ...... *A. reflexinervium* Croat

188b. Leaf blades not quilted, with primary lateral veins ascending.

189a. Leaf blades usually with conspicuous glandular punctations (at least abaxially).

190a. Leaf blades rounded to subtruncate at base, mostly drying greenish; stipe 15–40 mm long; southeastern Colombia, Amazonas and Bolívar in Venezuela; 75–380 m ...... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat

190b. Leaf blades attenuate to acute or obtuse at base, mostly drying brown or yellowish; stipe 1–20 mm long.

191a. Leaf blades usually elliptic to broadly elliptic; southeastern Colombia, southern Venezuela, northern Brazil; mostly below 500 m.

192a. Blades less than 10 cm wide; petioles less than 6.5 cm long, sheathed to midway; blade surfaces with reticulate veins drying prominently raised ...... *A. vinillense* Bunting

192b. Blades more than 15 cm wide; petioles more than 10 cm long, sheathed no more than ⅓ their length; blade surfaces with reticulate veins scarcely or not at all evident when dried ...... *A. bonplandii* Bunting subsp. *bonplandii*

191b. Leaf blades usually oblanceolate to obovate; Surinam and southern Venezuela; 400–1,500 m ...... *A. bonplandii* Bunting subsp. *guayanum* (Bunting) Croat

189b. Leaf blades without conspicuous glandular punctations.

193a. Spathe withered and turning yellow at anthesis; Trinidad to Brazil (Amapá); less than 500 m ...... *A. jenmanii* Engl.

193b. Spathe green to purplish, not withered at anthesis.

194a. Leaf blades oblong-linear, less than 7 cm wide; dry coastal Ecuador ...... *A. linguifolium* Engl.

194b. Leaf blades mostly oblanceolate to elliptic or ovate-elliptic, more than 7 cm wide.

195a. Primary lateral veins 10–26 per side.

196a. Peduncle more than 6× longer than petioles.

197a. Blades ovate-elliptic, rounded to broadly obtuse at base; Serranía de Huanchaca in eastern Bolivia; 750 m ...... *A. atropurpureum* R. Schultes & Maguire var. *thomasii* Croat

197b. Blades oblanceolate to obovate, acute to attenuate at base; Guiana Highlands or northern Antioquia.

198a. Spadix sessile; spathe less than 9 cm long, less than 1.5 cm wide; Antioquia, Colombia; 300–750 m ...... *A. anorianum* Croat

198b. Spadix stipitate 1.5–2.5 cm; spathe more than 9 cm long, more than 1.5 cm wide; Kaieteur Plateau, Guyana; 470 m ...... *A. cowanii* Croat

196b. Peduncle mostly less than 6× longer than petioles.

199a. Spadix less than 20× longer than thick at anthesis; Ecuador to southern Peru; 950–2,760 m ...... *A. dombeyanum* Brongn. ex Schott

199b. Spadix more than 20× longer than thick at anthesis.

200a. Leaf blades drying subcoriaceous and yellowish brown to green; coastal Ecuador; sea level to 400 m ...... *A. asplundii* Croat

200b. Leaf blades drying coriaceous and dark brown; eastern slopes of Andes in Colombia and Ecuador; 400–1,800 m .... *A. harlingianum* Croat

195b. Primary lateral veins mostly 4–10 per side.

201a. Leaf blades drying grayish to grayish brown; spadix more than 40× longer than thick; Vaupés and Amazonas in Colombia, adjacent Peru; 130–250 m .... *A. vaupesianum* Croat

201b. Leaf blades drying mostly green, yellow-green to brownish; spadix less than 40× longer than thick.

202a. Petioles mostly narrowly and deeply sulcate with blunt margins adaxially, rounded abaxially.

203a. Spathe usually spreading-ascending, coriaceous, conspicuously decurrent on peduncle; Rio de Janeiro and Espírito Santo, Brazil ... *A. solitarium* (Vell. Conc.) Schott

203b. Spathe usually reflexed, subcoriaceous, not conspicuously decurrent on peduncle; central Peru; 320–770 m .... *A. pachylaminum* Croat

202b. Petioles mostly flattened or shallowly sulcate with acute margins adaxially, mostly 1–3-ribbed abaxially.

204a. Leaf blades ovate-elliptic; spathe less than 6 cm long; San Martín, Peru .... *A. basirotundum* Croat

204b. Leaf blades oblanceolate to oblong-oblanceolate; spathe more than 6 cm long; southern Brazil, Bolivia, Paraguay, and northern Argentina; 150–1,700 m .... *A. paraguayense* Engl. var. *paraguayense*

108b. Spadix greenish to whitish.

205a. Primary lateral veins toward base of leaf blade perpendicular to midrib to retrorse to 130°.

206a. Leaf blades less than 45 cm long; La Paz, Bolivia; 700–900 m .... *A. paraguayense* Engl. var. *coroicoanum* Croat

206b. Leaf blades more than 50 cm long; central Peru; 500–1,800 m .... *A. latissimum* Engl.

205b. Primary lateral veins all ascending, not perpendicular or retrorse to the midrib; widespread in South America.

207a. Peduncle less than 3× longer than petiole.

208a. Species of the Amazon basin and drainage system.

209a. Peduncle less than 2× longer than spadix.

210a. Spadix longer than peduncle; infructescence with apical ca. ⅓ withered; cataphyll fibers fine, hairlike, reddish brown; Peru to Bolivia, Paraguay and Brazil; 50–900 m .... *A. plowmanii* Croat

210b. Spadix shorter than peduncle; infructescence usually not withered in apical ⅓; cataphyll fibers various, usually not fine and hairlike.

211a. Leaf blades mostly less than 4× longer than petioles; spadix more than 20× longer than thick .... *A. uleanum* Engl. var. *uleanum*

211b. Leaf blades mostly more than 4× longer than petioles; spadix less than 20× longer than thick (mostly much less).

212a. More than 12 flowers visible in either spiral; spadix whitish.

213a. Spathe shorter than spadix; leaf blades less than 18 cm wide, tinged red to purple below; petioles less than 10 cm long.

214a. Leaf blades less than 4× longer than broad; known only from Napo, Ecuador; 200 m .... *A. superbum* Madison subsp. *superbum*

214b. Leaf blades more than 4× longer than broad; known only from Río Cenepa area, Amazonas, Peru; 200–300 m .... *A. superbum* Madison subsp. *brentberlinii* Croat

213b. Spathe longer than spadix; leaf blades more than 18 cm wide, not tinged red or purple; petioles

more than 10 cm long; Acre, Brazil and adjacent Peru and Colombia; less than 300 m .... *A. galactospadix* Croat
- 212b. Mostly fewer than 12 flowers visible in either spiral; spadix mostly greenish.
  - 215a. Spadix appearing glaucous; Madre de Dios, Peru; 700 m .... *A. manuanum* Croat
  - 215b. Spadix not appearing glaucous.
    - 216a. Cataphylls persisting as an intact skeleton of fine, pale fibers; primary lateral veins conspicuously orange below on drying; peduncle and spadix erect; widespread in western Amazonia; below 500 m .... *A. ernestii* Engl. var. *ernestii*
    - 216b. Cataphylls persisting semi-intact, brown; primary lateral veins not drying orange; peduncle spreading, spadix erect; Pastaza, Ecuador; ca. 1,000 m .... *A. curtispadix* Croat
- 209b. Peduncle more than 2× (mostly more than 3×) longer than spadix.
  - 217a. Spadix usually appearing glaucous, or if not appearing glaucous, then cataphylls persisting as an intact network of fine, pale fibers and primary lateral veins drying conspicuously orange on lower surface; epiphytic in moist to wet forest life zones; lowland Amazonia.
    - 218a. Cataphylls persisting as an intact network of fine, pale fibers; leaf blades usually drying greenish, with primary lateral veins usually drying conspicuously orange on lower surface; spadix not appearing glaucous; widespread in western Amazonia; mostly below 500 m .... *A. ernestii* Engl. var. *ernestii*
    - 218b. Cataphylls persisting semi-intact, brown; leaf blades drying brown, with primary lateral veins not drying orange.
      - 219a. Leaf blades coriaceous, narrowly oblong-elliptic, to 9.5 cm wide, broadest at the middle, drying reddish brown with the tertiary veins prominulous on both surfaces; known only from Napo, Ecuador; 600 m .... *A. tenaense* Croat
      - 219b. Leaf blades subcoriaceous, usually oblanceolate and broadest well above the middle or rarely elliptic to broadly elliptic in *A. uleanum* var. *nanayense* (if elliptic then usually 11–16 cm wide), drying greenish to grayish green to brown, but not reddish brown, with tertiary veins not prominulous (or at least never on the upper surface).
        - 220a. More than 6 flowers visible in either spiral; western Amazonia; below 550 m .... *A. uleanum* Engl. var. *uleanum*
        - 220b. Fewer than 6 flowers visible in either spiral; Loreto, Peru, 100–160 m .... *A. uleanum* Engl. var. *nanayense* Croat
  - 217b. Spadix sometimes pale but not appearing glaucous; usually terrestrial or epilithic in mostly drier life zones.
    - 221a. Leaf blades glandular-punctate on lower surface.
      - 222a. Leaf blades less than 5 cm wide, less than 16 cm long; spadix with stipe less than 5 cm long; Surinam .... *A. maguirei* A. Hawkes
      - 222b. Leaf blades more than 5 cm wide, more than 16 cm long (usually more than 25 cm); spadix with stipe more than 5 mm long .... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat
    - 221b. Leaf blades not glandular-punctate on lower surface.
      - 223a. Leaf blades mostly more than 5× longer than broad.
        - 224a. Petioles flat to slightly convex adaxially, rounded abaxially; San Martín, Peru; 130–750 m .... *A. llewelynii* Croat
        - 224b. Petioles with prominent medial rib adaxially, 1–3-ribbed abaxially; southern Brazil, Paraguay, Bolivia, and northern Argentina; 150–1,700 m .... *A. paraguayense* Engl. var. *paraguayense*
      - 223b. Leaf blades less than 5× longer than broad.
        - 225a. Stem erect; peduncle more than 2× longer than petioles; San Martín, Peru; 360–700 m .... *A. tarapotense* Engl.

225b. Stem usually horizontal, creeping; peduncle mostly less than 2× longer than petioles; Brazil in Mato Grosso, Goiás, Pará, and Rondônia .... *A. lindmanianum* Engl.

208b. Species of central and northern Colombia, Venezuela, southeastern Brazil, not occurring in the Amazon basin.

226a. Primary lateral veins departing midrib at 70–90° angle; cataphylls hook-shaped; central Colombia; 900–1,750 m .... *A. caucavallense* Croat

226b. Primary lateral veins departing midrib at 30–70° angle; cataphylls straight.

227a. Leaf blades with margins prominently undulate; spadix often broadest near apex; eastern and southeastern Brazil; sea level to 1,300 m .... *A. affine* Schott

227b. Leaf blades with margins not prominently undulate; spadix broadest near base.

228a. Leaf blades with pale raphides visible at low magnification on drying; spathe 2–6 cm long; spadix 4–12 cm long; northern Venezuela, Curaçao; sea level to 600 m .... *A. wagenerianum* K. Koch & Bouché

228b. Leaf blades without pale raphides visible at low magnification on drying; spathe 8.0–12.5 cm long; spadix 12–33 cm long, northern Venezuela, northwestern Colombia, Curaçao; sea level to 1,800 m .... *A. crassinervium* (Jacq.) Schott

207b. Peduncle ≥3× longer than petiole.

229a. Cataphylls cucullate or hooked.

230a. Cataphylls hook-shaped and lanceolate; Colombia; 900–1,750 m .... *A. caucavallense* Croat

230b. Cataphylls cucullate, moderately broad, not at all lanceolate.

231a. Spadix pale lavender at anthesis, glaucous; inflorescence usually pendent; petioles rounded abaxially; leaf blades with slightly undulate margins; northern Colombia to Mexico; humid to wet regions, sea level to 1,600 m .... *A. salviniae* Hemsley

231b. Spadix reddish to violet-purple, not glaucous; inflorescence usually erect-spreading; petioles usually 1–4-ribbed abaxially, leaf blades with usually strongly undulate margins; dry coastal Ecuador and Peru; sea level to 890 m .... *A. barclayanum* Engl.

229b. Cataphylls straight, lanceolate.

232a. Species of the Amazon basin and drainage system.

233a. Spadix longer than peduncle; infructescence with apical ca. ⅓ withered; cataphyll fibers fine, hairlike, reddish brown; Peru to Bolivia, Paraguay, and Brazil; 50–900 m .... *A. plowmanii* Croat

233b.. Spadix shorter than peduncle; infructescence not withered in apical ca. ⅓; cataphyll fibers various, usually not fine and hairlike.

234a. Spadix appearing glaucous.

235a. More than 6 flowers visible in either spiral; western Amazonia; below 550 m .... *A. uleanum* Engl. var. *uleanum*

235b. Fewer than 6 flowers visible in either spiral; Loreto, Peru; 100–160 m .... *A. uleanum* Engl. var. *nanayense* Croat

234b. Spadix not appearing glaucous.

236a. Leaf blades glandular-punctate on lower surface.

237a. Leaf blades less than 5 cm wide, less than 16 cm long; Surinam .... *A. maguirei* A. Hawkes

237b. Leaf blades more than 5 cm wide, more than 16 cm long.

238a. Leaf blades mostly rounded to subtruncate at base, mostly drying greenish; stipe 15–40 mm long; southeastern Colombia, southern Venezuela; 75–380 m .... *A. bonplandii* Bunting subsp. *cuatrecasii* Croat

238b. Leaf blades attenuate to acute or obtuse at base, mostly drying brownish or yellowish; stipe 1–20 mm long.

239a. Primary lateral veins steeply ascending, departing midrib at less than 40° angle; known only from Cerro Aratitiyope, Amazonas, Venezuela; 990 m ..... *A. xanthoneurum* Bunting

239b. Primary lateral veins not steeply ascending, departing midrib at 40° or more angle; Surinam, southern Venezuela; 400–1,400 m.

  240a. Blades less than 10 cm wide; petioles sheathed to midway; blade surfaces with reticulate veins, drying prominently raised ..... *A. vinillense* Bunting

  240b. Blades more than 10 cm wide; blade surfaces with reticulate veins scarcely or not at all raised when dried ..... *A. bonplandii* Bunting subsp. *guayanum* (Bunting) Croat

236b. Leaf blades not glandular-punctate on lower surface.

  241a. Cataphylls persisting as an intact network of fine, pale fibers; primary lateral veins often drying conspicuously orange below; western Amazonia; mostly below 500 m *A. ernestii* Engl. var. *ernestii*

  241b. Cataphylls persisting semi-intact and brown; primary lateral veins not drying orange below.

    242a. Primary lateral veins more than 10 per side.

      243a. Spadix more than 20× longer than thick; leaf blades more than 5× longer than broad; known only from the Serranía de Cutucú, Ecuador; 1,300 m *A. bushii* Croat

      243b. Spadix less than 20× longer than thick; leaf blades less than 5× longer than broad; Ecuador to southern Peru; 950–2,760 m ..... *A. dombeyanum* Brongn. ex Schott

    242b. Primary lateral veins fewer than 10 per side.

      244a. Leaf blades more than 3× longer than broad, with prominently undulate margins; southern Brazil, Bolivia, Paraguay, and northern Argentina; 150–950 m ..... *A. paraguayense* Engl. var. *paraguayense*

      244b. Leaf blades less than 3× longer than broad, with slightly undulate margins; San Martín, Peru; 360–700 m ..... *A. tarapotense* Engl.

232b. Species of central and northern Colombia, northern Venezuela, southeastern Brazil, and not occurring in the Amazon basin or drainage system.

  245a. Spathe more than 10× longer than broad; spadix bluish green and appearing glaucous; central Colombia; 500–2,100 m ..... *A. glaucospadix* Croat

  245b. Spathe 1.6–6× longer than broad; spadix not bluish green or appearing glaucous.

    246a. Leaf blades with margins prominently undulate; spadix often broadest near apex; eastern and southeastern Brazil; sea level to 1,300 m ..... *A. affine* Schott

    246b. Leaf blades with margins not prominently undulate; spadix broadest near base.

      247a. Leaf blades with pale raphides visible at low magnification on drying; spathe 2–6 cm long; spadix 4–12 cm long; northern Venezuela, Curaçao; sea level to 600 m ..... *A. wagenerianum* K. Koch & Bouché

      247b. Leaf blades without pale raphides visible at low magnification on drying; spathe 8–12.5 cm long; spadix 12–33 cm long; northern Venezuela; northwestern Colombia; Curaçao; sea level to 1,800 m ..... *A. crassinervium* (Jacq.) Schott

Anthurium acutifolium Engl., Bot. Jahrb. Syst. 25: 365. 1898.

a. Anthurium acutifolium var. **acutifolium**. TYPE: Costa Rica. Puntarenas: Río Hakum, Buenos Aires (SE of San Isidro del General), elev. 250 m, *Pittier 6539* (lectotype, B; isolectotypes, BR, CR). Figures 23, 27.

Anthurium scopulicola Standley & L. O. Williams, Ceiba 3: 105. 1952. TYPE: Costa Rica. Puntarenas: vic. Palmar Norte, near sea level, *P. Allen 5788* (holotype, EAP; isotype, F).

Terrestrial or often epilithic; stem 1 cm diam.; roots descending, greenish, smooth to velutinous, elongate, blunt, 2–4 mm diam.; cataphylls subcoriaceous, lanceolate, 6–10 cm long, narrowly rounded to obtuse at apex with a subapical apiculum, dark green, drying dark tan, persisting semi-intact, then as linear fibers, eventually deciduous. *Leaves* erect to spreading, occasionally pendent; petioles (2)6–22 cm long, (3)6–9 mm diam., sharply D-shaped to subquadrangular, flattened to broadly sulcate with the margins sharply raised adaxially, sharply 3-ribbed abaxially, surface sparsely pale-speckled; geniculum slightly thicker than petiole, 1.4–2.5 cm long; blades subcoriaceous, elliptic to oblanceolate to broadly oblanceolate, gradually acuminate at apex (the acumen apiculate), attenuate to narrowly acute at base, (11)25–62 cm long, (3.5)5.5–27 cm wide, broadest at or above the middle, the margins weakly undulate; both surfaces semiglossy to matte, medium green above, paler below, drying greenish to greenish brown, matte; midrib flat at base, becoming acutely raised toward the apex above, sharply 2-ribbed at base, becoming sharply raised toward the apex below, paler than surface; primary lateral veins 8–12 per side, departing midrib at 40–45° angle, broadly arcuate to straight, acutely raised above, convexly raised below; tertiary veins weakly raised to sunken above, raised and darker than surface below; reticulate veins weakly visible above, obscure below; collective vein arising from about the middle of the blade or near the apex, sunken above, raised below, equally as prominent as primary lateral veins, 3–5 mm from margin. *Inflorescences* erect to erect-spreading; peduncle (17)24–53 cm long, 3–5 mm diam., 3–6 × as long as petiole, angular; spathe reflexed to reflexed-spreading, subcoriaceous, green, linear-lanceolate, 5–12 cm long, 0.6–1.1 cm wide, broadest just above the base, acuminate at apex (the acumen inrolled); spadix green to white to yellow, sometimes tinged with red-violet, sessile, long-tapered, rarely stipitate, to 2 cm, occasionally cylindroid, (4)7–16 cm long, 6–8 mm diam. near base, 3–4 mm diam. near apex; flowers square to rhombic, 1.9–3.4 mm long, 1.7–2.7 mm wide, the sides smoothly to weakly and jaggedly sigmoid; 5–6 flowers visible in principal spiral, 5–7 in alternate spiral; lateral tepals (0.5)1–1.7 mm wide, the inner margins straight, the outer margins 2–3-sided; stigma ellipsoid, 0.3–0.5 mm long; stamens held above tepals in a circle around the pistil, persisting; anthers 0.4–0.5 mm long, 0.6–0.8 mm wide; thecae oblong-ovoid, divaricate. *Infructescence* 1 cm diam., bearing berries in the lower part of the spadix; berries greenish yellow, obovoid to globose, rounded to somewhat mammilliform at apex, 3.8–4.7 mm long, 3.8–4 mm diam.; seeds 2 per berry, yellow-orange, oblong-ovoid, flattened dorsally, 2.9–3.5 mm long, 1.8–2.3 mm diam., 1.5–2 mm thick.

This species is known from Costa Rica and Panama principally on the Pacific slope in tropical moist, premontane wet, and tropical wet forest life zones, mostly from sea level to 900 m (rarely to 1,500 m). The species has been collected in Panama on the Burica Peninsula in Chiriquí Province. There are two varieties. The typical variety occurs throughout the range of the species, whereas the variety *herrerae* is restricted to drier parts of tropical moist forest.

Anthurium acutifolium var. *acutifolium* is distinguished by its terrestrial or epilithic habit, by its thin, green-drying, oblanceolate to broadly lanceolate leaf blades that are attenuate at the base, by its slender, long-tapered, usually green to yellowish spadix, and by its greenish yellow berries.

It is similar vegetatively to *A. consobrinum*, but does not have the early-emergent pistils characteristic of that species. See variety *herrerae* for comparison with that species.

COSTA RICA. PUNTARENAS: cabecera del Bkis, *Pittier 11129* (BR, CR, US); Boruca, *Pittier 4656* (BR); Buenos Aires, *Pittier 6539* (BR); Río Cañas–Buenos Aires, *Pittier 3862* (BR); Buenos Aires, Ujarrás, 300 m, *Ocampo 2818* (MO, CR); Las Cruces–Villa Neily, Fila de Cal, 500–600 m, *Gómez 19633* (MO, CR); Mellizas, 1,500 m, 8°54′N, 82°46′W, *Romero & Fallas 7* (CM, CR, MO); along road to microwave tower above Golfito, 90 m, *Croat 67615* (MO); Palmar Norte, *Croat 32962* (MO); Refugio de Fauna Silvestre, Peñas Blancas de Esperza, 10°7′50″N, 84°40′25″W, 1,000–1,400 m, *Herrera et al. 280* (B, CR, K, MO); W of Rincón de Osa, along abandoned "high road," 250–540 m, 8°42′N, 83°31′W, *Croat & Grayum 59853* (MO); Burica Peninsula, S of Puerto Armuelles, Quebrada Macho, 100–200 m, *Croat 22127* (F, K, MO); Osa Peninsula at Sirena, *Liesner 2921* (MO); Quebrada Palito, *Croat 22614* (MO). SAN JOSÉ: Quebrada Micos, 8.5 km W of Ciudad Colón, 600 m, 9°55.5′N, 83°17.5′W, *Grayum & Sleeper 6098* (B, CR, K, M, MO); 700 m, *Burger et al. 11938* (F, MO); El General basin, *Skutch 4749* (MO); Pacaca, *Pittier 4099* (BR); El Rodeo, *Hun-*

newell 16560 (GH); 800 m, 9°55′N, 84°16′W, *Barringer & Christenson 3653* (MO); vic. Santa Ana, *Burger & Liesner 7171* (MO), *Taylor 17387* (NY, US); Cerro Turrubares, Puriscal, *Jiménez 628* (US); Río del General, S of bridge over river, *Harmon & Fuentes 6210* (UMO); Río Uruca near Santa Ana, 900 m, *Burger & Liesner 7172* (MO). PANAMA. CHIRIQUÍ: Puerto Armuelles, *Woodson & Schery 904* (MO); W of Puerto Armuelles, *Croat 21938, 21972* (MO), *22474* (MO, PMA, RSA, US), *Liesner 49* (MO, PMA).

b. Anthurium acutifolium var. **herrerae** Croat, var. nov. TYPE: Costa Rica. Puntarenas: Esperanza, Macona, finca of José Herrera C. Miramar, 10°01′40″N, 84°36′33″W, 300–400 m, *Herrera 372* (holotype, MO 3587626; isotypes, CR, K, US). Figure 351.

Planta terrestris: internodia brevia; cataphyllum persistens semi-intactum; petiolus 7–9 cm longus, ca. 3 mm diam., sulcatus; lamina oblongo-elliptica aut elliptica, 21–33.5 cm longa, 7.8–13.5 cm lata, in sicco flavo-viridis; pedunculus 11.5–28.5 cm longus; spatha linearis-lanceolata, viridis, 3.8–5.8 cm longa, 8–10 mm lata; spadix sessilis, luteus, 2.5–5 cm longus.

Based on dried material only. Terrestrial; stem short; internodes short, 1–1.5 cm diam.; roots moderately dense, whitish, woolly-pubescent, to 10 cm long, 5 mm diam.; cataphylls narrowly long-acuminate, 5–6.5 cm long, drying brownish, persisting semi-intact, eventually fibrous at least basally. *Leaves* ± erect; petioles 7–9 cm long, ca. 3 mm diam., ± C-shaped, sulcate adaxially, rounded abaxially; geniculum slightly paler than petiole, less than 1 cm long; blades subcoriaceous, drying moderately thin, oblong-elliptic to elliptic, gradually long-acuminate at apex, attenuate at base, 21–33.5 cm long, 7.8–13.5 cm wide, broadest at middle; both surfaces semiglossy; midrib drying sharply acute above, several-ribbed and paler than surface below; primary lateral veins (9)10–14 per side, departing midrib at 50–55° angle (sometimes to 75° angle nearer the base), moderately straight to the margin, then arcuate toward apex; tertiary veins obscurely visible, some weakly raised below; collected vein usually arising from about the middle of the blade, less commonly from the lower third, flat above, weakly raised below, 3–10 mm from margin. *Inflorescences* erect; peduncle 11.5–28.5 cm long; spathe spreading to reflexed-spreading, green, linear-lanceolate, 3.8–5.8 cm long, 8–10 mm wide, broadest near base, inserted at 45–60° angle on peduncle, narrowly acuminate at apex, narrowly acute at base and weakly decurrent; spadix yellow, sessile, moderately tapered, 2.5–5 cm long, 3–5 mm diam. near base, 2–3 mm diam. near apex; flowers 4-lobed, 2.3–2.5 mm long, 2.2–2.7 mm wide, the sides jaggedly sigmoid, 5–6 flowers visible in principal spiral, 9–10 flowers visible in alternate spiral; tepals semiglossy, lateral tepals 1.3–1.4 mm wide, ± inequilaterally shield-shaped, the inner margins broadly rounded, the outer margins 3–4-sided; pistils not emergent but pushing up against the tepals and inclining their margins upward; stigma 0.4 mm long, 0.3 mm wide, brushlike, with medial separation, weakly exserted; stamens emerging in a regular sequence, the laterals preceding the alternates by ca. 5 spirals, the 3rd stamen preceding the 4th by 3–4 spirals, held tightly aggregated over and obscuring pistil; anthers 0.4–0.5 mm long, 0.7–0.8 mm wide; thecae ovoid, moderately divaricate. Infructescence not seen.

Anthurium acutifolium var. *herrerae* is endemic to Costa Rica, known only from the type collection in a dry area of tropical moist forest at 300–400 m.

It differs from the typical variety by its leaf blades, which are more elliptic and dry yellow-green rather than green. In addition, the dried epidermis of the blades is smooth with a distinct areolate cellular pattern on the upper surface at higher magnifications. In contrast, the typical variety dries dark green and has the surface rough and granular on high magnifications, with no sign of an areolate pattern.

The variety is named in honor of Gerardo Herrera, an outstanding Costa Rican collector working on the Costa Rican Flora Project with B. Hammel and M. Grayum of the Missouri Botanical Garden.

COSTA RICA. PUNTARENAS: Esperanza, Macona, finca of José Herrera C. Miriamar, 300–400 m, 10°01′40″N, 84°36′33″W, *Herrera 372* (CR, K, MO, US).

Anthurium acutissimum Engl., Bot. Jahrb. Syst. 25: 398. 1898. TYPE: Ecuador. San Nicolas, *Sodiro s.n.* (holotype, B). Figures 24, 25.

Anthurium acutissimum var. *maius* Sodiro, Anales Univ. Centr. Ecuador 22, no. 162: 267. 1908. TYPE: Ecuador. *Sodiro s.n.* (n.v.).

Epiphytic, epilithic or terrestrial; stem short, 3–4(10) cm diam.; roots forming a dense mass, descending, drying whitish gray, somewhat pubescent, elongate, 2–4 mm diam.; cataphylls linear-lanceolate, (7)12–17 cm long, linear-elongate, drying brown to reddish brown, persisting semi-intact or as coarse linear fibers or as a reticulum of fibers. *Leaves* spreading to pendent; petioles (7.5)20–50 cm long, 5–12 mm diam., terete to subterete, somewhat flattened adaxially, rounded abaxially, surface pale-speckled; geniculum flattened, slightly darker and thicker than petiole when dried, 1–2 cm long; blades usually pendent, coriaceous, oblong to oblong-elliptic, acuminate at apex, acute to narrowly acute at base, 60–118 cm long, 7.5–14 cm wide, broadest at or near the middle, the margins flat; upper surface matte, semivelvety, lower surface glossy, both surfaces dark to medium green, drying green to yellowish green, matte; midrib convexly raised, paler than surface above, prominently convex, much paler than surface below; primary lateral veins numerous, more than 25 per side, departing midrib at 50–70° angle, straight to the collective vein, flat and pale above, obscure below, slightly raised above when dried, more so below; interprimary veins moderately numerous, drying almost as conspicuous as primary lateral veins, raised above and below; tertiary veins obscure; collective vein arising from near the base, weakly raised above and below when dried, equally as prominent as primary lateral veins, 4–17 mm from margin. *Inflorescences* spreading to pendent; peduncle 22–64 cm long, (2)3–4 mm diam., equally or to 1.7 × as long as petiole, terete; spathe spreading, subcoriaceous, green to green-tinged with purple at margins, oblong-lanceolate, (5.5)8–21 cm long, 1.1–2.4 cm wide, broadest near the base, acuminate at apex (the acumen inrolled, to 25 mm long), acute at base; stipe 7–20 mm long in front, 0–4 mm long in back; spadix green to yellow-green, subsessile, erect, straight to curved, held at 160–180° angle from peduncle, (6.5)10.5–21.5 cm long, (3)6–8 mm diam. near base, (2)4–5 mm diam. near apex, broadest at the base; flowers square to rhombic, 2.2–2.8 mm in both directions, the sides smoothly sigmoid, (3)4–5 flowers visible in principal spiral, 6–9 in alternate spiral; tepals matte, pale-punctate when dried; lateral tepals 1.3–2 mm wide, the inner margins convex, becoming turned up against the pistil, the outer margins 2-sided; pistils emergent, raised, same color as tepals; stigma slitlike, becoming ellipsoid, 0.5–0.8 mm long; stamens emerging from the base, held well above the tepals, persisting, laterals emerging almost to apex before the alternates emerge in basal third, held in a circle around the pistil; filaments white, flattened, exserted, 0.7–1 mm long, 0.6–0.7 mm wide; anthers drying yellowish to brown, 0.5–0.8 mm long, 0.4–0.7 mm wide; thecae oblong, not divaricate. *Infructescence* pendent; spathe persisting, green or withered; spadix ca. 23–30 cm long, 2 cm diam., with berries scattered throughout; berries yellow-orange becoming orange, ovoid to broadly ellipsoid, "hollow" when rehydrated, acute at apex, (6)8.6–9.5 mm long, 4–4.5 mm diam.; pericarp thickened, with some raphide cells; seeds 2 per berry, yellowish, oblong-ovoid, flattened, 3.7–4.8 mm long, 2.3–2.4 mm diam., 1.3–1.6 mm thick, with a transparent, gelatinous appendage at both ends.

A member of series *Multinervia*, *Anthurium acutissimum* is known from the provinces of Pichincha and Los Ríos in Ecuador where it occurs at 650–1,200 m in premontane moist and premontane wet forest life zones.

This species is characterized by its very elongate, mostly pendent, coriaceous, green-drying leaves, which are narrowly acute at the base and long-acuminate at the apex, by its large cataphylls which persist semi-intact as a reticulum of pale fibers, by its long-pedunculate inflorescence which has a tapered, green spadix with anthers exserted on long, whitish filaments and by its ovoid to broadly ellipsoid orange berries.

Anthurium acutissimum is most closely allied to *A. holmnielsenii*, which has generally more erect-spreading leaves, D-shaped petioles, which are sulcate adaxially with prominently raised, sharp margins and broader blades (averaging 5.1 vs. 8.6 × longer than broad). Leaves of both species dry dull green and matte.

The label data of *Madison 3826* mention that the plant was "ant inhabited" and that the stem was "massive, 10 cm thick," perhaps owing to its being myrmecophilous; the manner in which it was inhabited by ants is not mentioned, and root mass probably accounts for this exceptional measurement.

ECUADOR. LOS RÍOS: 12 km E of Patricia Pilar, 650 m, *Madison 3826* (QCA, SEL). PICHINCHA: Chiriboga Road, Alluriquín–Chiriboga, 950–1,100 m, *Madison 4198* (originally *2094*) (MO, SEL), *Madison 4075* (MO, SEL); 2–3 km from main Aloag–Sto. Domingo de los Colorados rd., 890–1,010 m, 0°18′13″S, 78°54.5′W, *Croat 56979* (MO, US); 12 km E of Patricia Pilar, 650 m, *Madison 3828* (SEL); Río Pilatón, *Sodiro 20* (B); Quito–Santo Domingo de los Colorados, 44 km E of Santo Domingo, 1,200 m, 0°23′S, 78°50′W, *Hammel & Wilder 16081* (B, MO); Río Pilatón–Río Toachi confluence, 800–900 m, *Madison 4030* (K, QCA, SEL), *Sparre 18453* (S).

Anthurium affine Schott, Oesterr. Bot. Wochenbl. 5: 82. 1855. TYPE: illustrated by Schott Aroideae 465 (lectotype). Figures 26, 28, 29.

Terrestrial; stem short, 1.5–4 cm diam.; roots moderately numerous, descending to spreading, greenish, smooth to weakly pubescent, thick, moderately elongate, 3–8 mm diam.; cataphylls subcoriaceous, broadly lanceolate, 6–20 cm long, acuminate to narrowly rounded and prominently apiculate at apex, light green, drying brown, persisting semi-intact, eventually dilacerating into coarse linear fibers. *Leaves* erect to spreading; petioles 5–28 cm long, 7–16 mm diam., U-shaped to quadrangular, shallowly to prominently sulcate, sometimes with a medial rib adaxially, prominently and sharply raised marginally, usually (1)3–5-ribbed, or sometimes rounded abaxially; geniculum thicker and slightly paler than petiole, becoming fissured transversely with age, 1–2.5 cm long; blades moderately coriaceous, obovate to oblanceolate to ± elliptic, obtuse to short-acuminate or rounded at apex (the acumen apiculate), acute to obtuse to rounded or shallowly cordate at base, 33–95 cm long, 10.5–32 cm wide, broadest at or above the middle, the margins markedly undulate; upper surface matte to semiglossy, dark green, lower surface semiglossy to glossy, paler, both surfaces drying olive-green to yellow-green; midrib flat and 1-ribbed at base, becoming obtusely angled toward the apex above, slightly paler than surface, prominently thicker than broad and 2–3-ribbed at base below, becoming convexly raised toward the apex, paler than surface; primary lateral veins 7–14 per side, departing midrib at 40–60° angle, slightly arcuate to the margin, prominently and convexly raised above and below; interprimary veins absent; tertiary veins obscure to weakly sunken above, slightly raised and darker than surface below; reticulate veins not visible to prominulous when dried, collective vein arising from near the apex or absent, less prominent than primary lateral veins when present. *Inflorescences* erect, somewhat shorter than the longest leaves; peduncle 31–78 cm long, 4–15 mm diam., 2–9× as long as petiole, green or green-tinged with purple at apex, subterete; spathe reflexed to recurled, moderately thick, purple to green tinged with purple, ovate to broadly lanceolate, (3.5)5–10 cm long, 1.7–7.5 cm wide, acuminate at apex, acute and usually decurrent to 1–3(6) cm at base; stipe 0.5–5 cm long, 6–18 mm diam., pale green to purple; spadix olive-green to yellowish, cylindroid to clavate, subsessile to long-stipitate, erect, straight, 4.5–17 cm long, 5–15 mm diam. near base, 6–10 mm diam. near apex, broadest near the middle or near the apex; flowers ± square, 1.6–2.2 mm in both directions, the sides straight to sigmoid; 7–14 flowers visible in principal spiral, 4–10 in alternate spiral; tepals slightly roughened, pale-punctulate (when dried); lateral tepals 0.7–1 mm wide, the outer margins 2-sided, the inner margins convex to rounded; stamens emerging in a regular sequence from the base, semi-erect in a tight cluster above the pistil, arching over and obscuring it; anthers 0.5–0.7 mm long, 0.7–0.8 mm wide; thecae somewhat divaricate; pollen creamy. *Infructescence* erect; spadix ca. 2.5 cm diam. (not including exserted berries); berries red to rich purple-maroon or purple-maroon at apex becoming red below, whitish toward the base, obovoid to oblong-ellipsoid, truncate at apex, 7–13 mm long, 4–7 mm diam.; seeds oblanceolate, 5–8 mm long, 2–3 mm diam.

Anthurium affine is found in eastern and southeastern Brazil in the states of Mato Grosso, Minas Gerais, Goiás, Bahia, and Pernambuco from sea level to 1,300 m on rocky slopes, along streams, and in open areas. *Heringer 7801* notes the vegetation type as "cerrado mata ciliar."

This species can be recognized by its large, coriaceous leaf blades, frequently with strongly undulate margins, and its relatively short spadix, which is sometimes broadest near the apex.

Because of its fruit color, spadix shape, and geographical isolation, *A. affine* is not easily confused with any other species.

The species was placed into synonymy with *Anthurium solitarium* by Engler, but that species has an elongate, tapered spadix and an elongate spathe, and is primarily restricted to southern coastal Brazil. Engler's drawings of *A. affine* are, in fact, *A. solitarium.*

Confusion arising from Engler's treatment of *A. affine* as a synonym of *A. solitarium* has permeated subsequent publications and label data in Brazil, Europe, and the United States, where it has been cultivated to a limited extent for many years. To this day, any member of sect. *Pachyneurium* from eastern Brazil is usually called *Anthurium solitarium* in botanical gardens and on herbarium labels, and annotations on the latter reflect the confusion between the two epithets.

Anthurium macedoanum, an unpublished name attributed to A. D. Hawkes, was based on an unusually broad-leaved form of *A. affine* (*Macedo 2185*) from San Vincente in the state of Minas Gerais.

Confusion has also resulted from the Field Museum photograph (FM 11838) of *Glaziou 9040* from Rio de Janeiro. This photograph is actually *A. solitarium*, not *A. affine* as annotated by Engler, nor a type of *A. affine* as suggested by the photograph.

BRAZIL. BAHÍA: *Blanchet 1055* (G); Hwy BA:052, Chapada da Diamantina, E of Morro do Chapeú, 900 m, *Davidse et al. 11902* (K, MO); N of Itapuã, Salvador, 0 m, 12°58'S, 38°23'W, *Plowman & Almeida 10046* (F, K, MO); Mato Grosso–Serra do Rio Contas, N of Vila do Rio do Contas, 980 m, 13°33'S, 41°49'W, *Harley et al. 19973* (K, MO); 3 km N of Milagres, BR-116, *Hatsch-*

bach 45069 (K); Morro do Chapeú, 900 m, *Hatschbach 42428* (K); Mucugê, 2 km along Andaraí road, 850 m, 12°59'S, 41°21'W, *Harley et al. 20615* (K); *Hatschbach 47955* (K); Pasto Guanabara, Faz Morro de Pedra-Itaberaba, *Ferreira 191* (K); Rio do Contas-Livramento, cachoeira near road, *Storr 194* (K); Rio Cumbuca, N of Mucugê on Andaraí Road, 850 m, *Harley 16000* (K, US); Rio Ferro Duido, 19.5 km SE of Morro do Chapeú on BA 052 road to Mundo Novo, 900 m, 11°38'S, 41°02'W, *Harley et al. 19254* (K, MO), *22865* (K); Rio Itapicuru, Jacobina, 450 m, *Martinelli 5143* (RB); Rio Paragucu, Andaraí-Mucugê, BA Mucugê, *Pirani et al. 1625* (K, MO); Serra da Jacobina, Senhor do Bonfim-Juàzeiro, BA 130, 12 km N of Senhor do Bonfim, W of Estiva, 850 m, *Harley 16589* (K); Serra das Almas, NW of Rio de Contas, 1,000-1,200 m, *Mori & Benton 13536* (NY); Serra do Jatobá, Morro do Couro or Morro São Cristóvão, 500-600 m, 12°54'S, 39°52'W, *Harley 19427* (K), *19429* (K, MG, MO). Serra do Rio do Contas, Rio do Contas-Mato Grosso, 12-14 km N of Rio do Contas, 1,200 m, 13°28'S, 41°50'W, *Harley 15196* (K); Serra do Sincorá, 5 km S of Andaraí, road to Mucugê near bridge over Rio Paraguacu, 400 m, 12°50'S, 41°19'W, *Harley et al. 18594* (K, MO); Serra dos Lençoís, Seabra-Itabera, 7-10 km, W of Lençoís turnoff, by Rio Mucugezinho, 12°28'S, 41°26'W, *Harley 22695* (K); Mpo. Jaguarguara, Jaraguara-Milagras, Rodovia BR116, *Silva et al. 1576* (K); Mpo. Lençoís, NW of Lençoís, Barro Branco road, 630 m, 12°32'S, 41°20'W, *Lewis et al. 920* (K, MO); Mucugezinho Rodovia BR242, 720-760 m, *Lewis & Carvalho s.n.* (K); Mpo. Livramento do Brumado, Rodovia Liv. do Brumado-Rio do Contas, 600 m, *Mori et al. 12242* (K, NY); Mpo. de Palmeiras, ca. km 250 na Rodovia BR 242, *de Carvalho & Saunders 2966* (NY). GOIÁS: Dianopolis, *Pirani et al. 1965* (K, MO, SPF). MATO GROSSO: cultivated at Floricultura Campineira Hda. Campinas, São Paulo (*Oliveira 1420*), *Hutchinson 8849* (MO). MATO GROSSO DO SUL: Ituiutaba, (Furma?) de São Vicente, *Macedo 1237* (RB), *1910* (RB, UC, US), *2185* (UC, US). MINAS GERAIS: Mpo. Diamantina, Diamantina, 1,200 m, *Martinelli 5900* (RB); Rodovia Guinda-Cons. Mata, *Hatschbach & Kummrow 49742* (MBM, MO); road to Diamantina, SW of Mendanha and Rio Jequiti, 1,150 m, *Anderson 8841* (F, NY, US); NE of Diamantina, on road to Mendanha, 1,300 m, *Irwin et al. 22630* (US); Rio Abaite, Rodovia Brasilia, *Heringer 7801* (MG); Rio Jequiti, E of Diamantina, 790 m, *Irwin et al. 27430* (MO, NY, SEL, US); Mpo. Diamantina, Biribiri, *Hatschbach & Pelada 27550* (K), *27990* (MU), *Zappi et al. 47358* (MO); Joaquim Felício, Serra do Cabral, *Zappi et al. 39756* (MO); 1,160 m, 17°42'S, 44°18'W, *Pirani et al. 2183* (K, MO, SPF). PARAÍBA: *Xavier s.n.* (RB), *42082* (RB); vic. João Pessoa, nos Tubuleiros da Costa, *Xavier 9191* (K). PERNAMBUCO: Tapera, *Pickel 2373* (US); Praia do Guaibu, 35 km S of Recife, 10-30 m, *Tsugaru et al. B-1377* (MO, OOM); Rio Formoso, Horto Florestal de Saltinho, *Falcao et al. 775* (MO, RB).

Anthurium angustilaminatum Engl., Bot. Jahrb. Syst. 25: 411. 1898.

a. **Anthurium angustilaminatum** subsp. **angustilaminatum.** TYPE: Ecuador. Pichincha: Gualea, *Sodiro s.n.* (holotype, B; isotypes, P, Q). Figure 31.

Anthurium angustilaminatum var. *albidum* Sodiro, Anales Univ. Centr. Ecuador 22(156): 21. 1906. TYPE: Ecuador. Imbabura: Guallupe, *Sodiro s.n.* (n.v.).

Anthurium angustilaminatum var. *brevipes* Sodiro, Anales Univ. Centr. Ecuador 22(156): 21. 1906. TYPE: Ecuador. Imbabura: between Paramba and Guallupe, *Sodiro s.n.* (n.v.).

Anthurium angustilaminatum var. *crassum* Sodiro, Anales Univ. Centr. Ecuador 22(156): 20. 1906. TYPE: Ecuador. Pichincha: Nanegal, *Sodiro s.n.* (n.v.).

Anthurium angustilaminatum var. *gladiatum* Sodiro, Anales Univ. Centr. Ecuador 22(156): 20. 1906. TYPE: Ecuador. Imbabura: between Coajara and Paramba, *Sodiro s.n.* (n.v.).

Based on dried material only. Terrestrial; stem short, 1.8-2.5 cm diam.; roots moderately numerous, grayish brown, puberulent, slender, elongate, 2-3 mm diam.; cataphylls 9.5-20 cm long, acuminate to short-acuminate at apex, light brown, persisting semi-intact as fine linear fibers; petioles 8-15 cm long, 5-8 mm diam., D-shaped to subtriangular, broadly rounded to sulcate adaxially, the margins thin, prominently raised, appearing winged, rounded and acutely to obtusely 1-ribbed abaxially; geniculum slightly thicker than petiole, (0.5)1.5-2 cm long; blades coriaceous, narrowly to broadly oblong-elliptic, acute, sometimes shortly acuminate at apex, acute to narrowly acute (rarely rounded) at base, 40-94 cm long, 6-12 cm wide, broadest at or near the middle, the margins narrowly undulate; upper surface green, slightly paler below, both surfaces matte to semiglossy, yellowish brown, sometimes greenish; midrib convexly raised above, prominently raised and 1-ribbed at base, becoming narrowly acutely raised toward the apex below; primary lateral veins darker than surface, 25-35 per side, departing midrib at 30-55° angle, straight to weakly arcuate to the collective vein, prominently raised above; interprimary veins numerous, almost as conspicuous as primary lateral veins; tertiary veins prominulous; collective vein arising from the base, raised above and below, equally as prominent as primary lateral veins, 5-10 mm from margin. *Inflorescences* apparently spreading; peduncle 15-55 cm long, 5-8 mm diam., 2.2-3.1 × as long as petioles, green, sharply angular, rarely terete; spathe erect to reflexed, subcoriaceous, yellowish green, lanceolate to ovate-lanceolate, 5-9 cm long, 1-1.3 cm wide, acuminate at apex (the acumen inrolled), narrowly acute at base; spadix dark purple, cylindroid, subsessile, 6-12 cm long, 5-12 mm diam.; flowers rhombic, 1.9-2.4 mm long, 1.5-2.1 mm wide, 4-6 flowers visible in principal spiral, 9-12 in alternate spiral; tepals minutely papillate, lateral tepals 1.4-2 mm wide, the inner margins straight, sometimes broadly convex, occasionally turned up against the pistil, the outer margins 2-sided; pistils slightly raised; stigma slitlike, 0.5–0.7 mm long; filaments prominently exserted, holding anthers above tepals, the exserted part 0.5–0.7 mm long; anthers yellow, 0.4–0.5 mm long, 0.5 mm wide; thecae oblong-ovoid, not divaricate. *Infructescence* with spathe persisting; spadix ca. 15 cm long, 1 cm diam.; berries drying 2.5–4 mm diam., probably orange.

A member of series *Multinervia*, *Anthurium angustilaminatum* is comprised of two subspecies, the typical one known only from the slopes north of Volcán Pichincha in Pichincha Province in northern Ecuador, and subsp. *cibuserpentis*, from Cotopaxi and El Oro further to the south. Subspecies *angustilaminatum* occurs in a premontane wet forest life zone at ca. 1,200 m.

The species is distinguished by its coriaceous, oblong-elliptic leaf blades with numerous primary lateral and interprimary veins, and its dark purple spadix.

The typical subspecies appears to be most closely allied to *A. soukupii*, which ranges from southern Ecuador to Bolivia, and is very similar morphologically. *Anthurium angustilaminatum* subsp. *angustilaminatum* occurs on the Pacific slope of Ecuador at ca. 1,200 to 1,600 m in a premontane wet or lower montane moist forest life zones, whereas *A. soukupii* occurs on the other side of the Andes at over 2,000 m in various montane forest life zones. Neither species has been studied in cultivation, and for the present, it is felt that the two taxa should be recognized as distinct based on phytogeography, and that study of further collections can be expected to reveal more definitive morphological features for both species. Both subspecies of *A. angustilaminatum* differ from *A. soukupii* in having short, compact (rather than elongate) stems. The habit is epiphytic in at least subsp. *cibuserpentis*, rather than terrestrial as for *A. soukupii*.

A new subspecies, subsp. *cibuserpentis*, is described in the present paper and is distinguished from the typical subspecies mainly by its smaller overall size and abruptly obtuse to truncate leaf bases. It occurs further to the south in Cotopaxi and El Oro provinces, at higher elevations in drier life zones. Like the typical subspecies, it is known only from the Pacific slope of the Andes in Ecuador.

Three of the four varieties described by Sodiro (1906) were collected in the same area in Imbabura Province, not far from the type locality of var. *crassum* and also the typical subspecies. All collections are from the same life zone. Although the type specimens of all four varieties described by Sodiro have not been seen and probably no longer exist (except for a photograph of the type of var. *crassum*), the differences given by Sodiro are slight, and no key is given to distinguish between the varieties. In view of the fact that Sodiro's species concept was often quite liberal, and that the type of var. *crassum* can scarcely be distinguished from material of the typical variety, it seems best to reduce all four varieties to synonymy.

ECUADOR. PICHINCHA: Gualea, ca. 1,200 m, *Sodiro 18* (B, P); *Sodiro s.n.* (G, MO, SI, US); Parroquia Calacali, Reserva geobotanica del Pululahua, Sta. Rita, 0°05′N, 78°30′W, 1,600 m, *Ceron et al. 4763* (MO, QCNE).

b. Anthurium angustilaminatum subsp. **cibuserpentis** Croat, subsp. nov. TYPE: Ecuador. Cotopaxi: Pilalo, Km 80 on Quevedo–Latacunga road, 2,500 m, *Dodson 15397* (holotype, MO 3247505). Figure 32.

Differt a subsp. typicum petiolo breviori; lamina oblonga, basi rotundata vel truncata, nervis primariis lateralis numerosis.

Based on dried material only. Epiphytic; stem short, ca. 2 cm diam.; roots dense, numerous, ascending to spreading, whitish, velutinous, short, tapered, ca. 3 mm diam.; cataphylls subcoriaceous, to at least 8 cm long, yellowish tan, persisting as fine linear fibers. *Leaves* erect; petioles 3.5–7 cm long, ca. 3–6 mm diam., D-shaped, flattened with the margins raised adaxially, rounded abaxially; geniculum 0.3–1 cm long; blades subcoriaceous, oblong-lanceolate to oblong-elliptic, acute at apex, truncate to narrowly rounded at base, 32–61 cm long, 5–9 cm wide, broadest at or near the middle, the margins slightly undulate; both surfaces matte to semiglossy and yellowish green; midrib convexly raised, becoming acute toward the apex above, higher than broad at base, becoming convexly raised toward apex below; primary lateral veins numerous, to more than 20 per side, departing midrib at 50–70° angle, ± straight to the collective vein, raised above and below; interprimary veins numerous, almost as conspicuous as primary lateral veins; tertiary veins raised; collective vein arising from near the base, equally as prominent as primary lateral veins, 3–8 mm from margin. *Inflorescences* erect; peduncle 17–23 cm long, ca. 3 mm diam., 3.9–4.2× as long as petioles, terete; spathe spreading, subcoriaceous, green, at least 7 cm long, 1–1.5 cm wide, acute at base; spadix (post-anthesis) green, slightly tapered, ca. 8 cm long; flowers apparently ± square, 5–6 flowers visible in principal spiral, 6–9 flowers visible in alternate spiral, lateral tepals 2–2.5 mm wide, the inner margins ± straight, becoming turned up against pistil, the outer margins 2-sided; stigma ellipsoid, 0.4–0.5 mm long; anthers 0.5–0.6 mm long, 0.5–0.7 mm wide; thecae oblong, slightly divaricate. *Infructescence* erect; spathe persisting and withered or absent; spadix ca. 12 cm long, ca. 1.2 cm diam., with berries scattered throughout; berries greenish (immature), oblong, mammilliform at apex, 5.5–6 mm long, 3.2–3.6 mm diam.; pericarp thickened, with raphide cells present; seeds 2 per berry, orange-brown when dried, ca. 3 mm long, 2.2–2.4 mm diam., ca. 1 mm thick.

Anthurium angustilaminatum subsp. *cibuserpentis* is known from the provinces of El Oro and Cotopaxi in Ecuador, where it occurs at 2,135 to 2,500 m in lower montane moist and lower montane dry and/or montane moist (undeterminable from map) forest life zones.

The subspecies is distinguished by its short petioles and more or less oblong leaf blades with numerous primary lateral veins, which are rather abruptly and shortly rounded to truncate at the base. The color of the spadix at (or even near) anthesis is unknown.

Anthurium angustilaminatum subsp. *cibuserpentis* differs from the typical subspecies principally by its abruptly ending leaf bases and by occurring in drier life zones at higher elevations (2,135–2,500 vs. 1,200–1,500 m) to the south, rather than north, of the equator. The new subspecies is smaller in overall size as well. See discussion under subsp. *angustilaminatum* for distinguishing both subspecies from *A. soukupii.*

The name is taken from "cibus" (Latin, meaning food) and "serpentis" (Latin, meaning snake) in reference to label data stating that the fruits of the plant are eaten by snakes.

ECUADOR. COTOPAXI: Km 80 on road Quevedo–Latacunga, 2,500 m, *Dodson 15397* (MO). EL ORO: Pampa de los Cedros, S of Cerro Chivo–Turco, 2,135–2,285 m, *Steyermark 53764* (US, NY).

Anthurium anorianum Croat, sp. nov. TYPE: Colombia. Antioquia: between Segovia and Cañaverales, vic. Río Bagre, 300 m, *Croat 56757* (holotype, MO 3116672-74). Figures 30, 33, 34

Planta epiphytica; internodia brevia, 2–4 cm diam.; cataphyllum lanceolatum, persistens semi-intactum; petiolus 4–9 cm longus, 9–17 mm diam., obtuse D-formatus, late sulcatus; lamina late oblanceolata, basi attenuata, 36–100 cm longa, (12)20–60 cm lata; spatha lanceolata, 7.5–9(35)cm longa, 1–1.3 cm lata; spadix purpureus, leniter contractus, 14–23 cm longus, 5–6 mm diam.

Epiphytic; stem short, 2–4 cm diam.; roots numerous, very dense, spreading, green to whitish, grayish brown on drying, moderately thick, 6–24 cm long, 3–5 mm diam. when fresh, drying 1–2 mm diam.; cataphylls subcoriaceous, lanceolate, 2–3 cm long, acute at apex, green, drying brown (B & K yellow-red 4/10), persisting semi-intact. *Leaves* spreading; petioles 4–9 cm long, 9–17 mm diam., obtusely D-shaped, broadly convex adaxially with the margins shortly and sharply raised, rounded to 3–5-ribbed abaxially, surface pale-speckled, reddish when young; geniculum thicker and slightly paler than petiole, 1–1.5 cm long, prominently and transversely fissured with age; blades subcoriaceous, broadly oblanceolate, acute to acuminate at apex (the acumen apiculate), attenuate at base, 36–100 cm long, (12)20–60 cm wide, broadest above the middle, the margins broadly and shallowly undulate; both surfaces glossy to semiglossy, medium green above, slightly paler below, drying brown to greenish brown; midrib flat to obtusely raised at base, becoming acutely raised toward the apex and slightly paler than surface above, obtusely raised below and slightly paler than surface, pale short-lineate; primary lateral veins 12–16 per side, departing midrib at 40–55° angle, straight or weakly ascending to the margin, sunken above, prominently convex and slightly paler than surface below; tertiary veins obscure above, prominulous and slightly darker than surface below, drying raised on both surfaces; collective vein arising in upper third or fourth of the blade, sunken above, raised below, less prominent than primary lateral veins, raised above and below on drying, 4–20 mm from margin. *Inflorescences* probably erect-spreading; peduncle 69–105 cm long, 5–15 mm diam. when dried, 6–9× as long as petioles, green, drying brown to pinkish brown, terete; spathe spreading, slightly recurled, subcoriaceous, green, tinged with purple near the apex, lanceolate, 7.5–9(35) cm long, 1–1.3 cm wide, broadest near the base, acuminate at apex (the acumen inrolled), acute to almost decurrent at base; stipe 1.5–1.8 mm long in front; spadix purple to dark purple, long-tapered, 14–23 cm long, 5–6 mm diam. near base, 3–4 mm diam. near apex; flowers ± rhombic, 3–3.3 mm long, 2.8–3 mm wide, the sides straight, 4–5 flowers visible in principal spiral, 7–8 in alternate spiral; tepals smooth, pale-punctate, lateral tepals 2.1–2.4 mm wide, the inner margins straight to broadly convex, the outer margins 2-sided; pistils green; stigma ellipsoid, 0.4–0.6 mm long; anthers 0.3–0.4 mm long, 0.4–0.5 mm wide; thecae oblong, not divaricate. *Infructescence* with the spathe persisting withered; spadix (12)18–41(100) cm long, 1.4–1.6 cm diam., bearing berries in the basal portion only; berries dark red, probably acute at apex, drying 4.8–5.5 mm long, 3–3.2 mm diam.

Anthurium anorianum is endemic to Colombia in the Department of Antioquia at 300–750 m in tropical moist and tropical wet forest life zones. All collections to date have been made from the northern drainage of the Río Canoa.

This species is characterized by its short petioles, its subcoriaceous, broadly oblanceolate leaf blades which are attenuate at the base and acuminate at the apex and dry tan to brownish green, and by its slender, long-tapered, dark red to purplish-brown spadix. Especially distinctive is the usually pinkish coloration of the peduncle and primary lateral veins on drying.

Anthurium anorianum is similar in appearance to *A. vaupesianum*, also from Colombia, with which it shares a slender, long-tapered spadix. *Anthurium vaupesianum* differs in being smaller in overall size, in having obovate leaf blades, and in occurring in the Amazon basin.

The species is named after the Municipio Anorí, where most collections were made.

COLOMBIA. ANTIOQUIA: Río Bagre, Segovia–Cañaverales, 1 km NE of village of El Río, 300 m, 7°10′N, 74°38′W, *Croat 56757* (COL, K, MO, US); Segovia–Antioquia, village of El Río, 750 m, *Renteria et al. 1576* (HUA, MO); Mpo. Anorí, Buenos Aires, Corregimento de Providencia, 500–700 m, *Soejarto 2922* (HUA), *2995* (COL, HUA); Río Anorí, Dos Bocas–Anorí, Buenos Aires, trail along Quebrada Sarmiento, 600 m, *Soejarto et al. 4355* (MO); Mpo. Cáceres, El Doce Baja Cauca, 7°27′N, 75°20′W, *Callejas 210* (HUA); Mpo. Valdivia, Corregimiento Puerto Valdivia, 5 km from Puerto Valdivia at Río Pescado, 410 m, 7°20′N, 75°20′W, *Callejas et al. 3447* (HUA, MO, NY).

Anthurium asplundii Croat, sp. nov. TYPE: Ecuador. Los Ríos: Río Blanco, across river from Villa Hermosa, 3 km S of Sto. Domingo–Esmeraldas hwy. at Km 24, 00°05′S, 79°15′W, *Croat 50688* (holotype, MO 3313109-10; isotypes, K, QCA, US). Figures 8, 10, 35–37, 43.

Planta epiphytica; internodia brevia, 3.5–5 cm diam.; cataphyllum lanceolatum; petiolus 7–15(25) cm longus, ca. 10 mm diam., adaxiale complanatus cum costa mediana, abaxiale rotundus; lamina coriacea-subcoriacea, late oblanceolata-elliptica, acuta apud apicem, acuta usque late rotundata ad vadosa cordata apud basim, (60)90–125 cm longa, 20–34 cm lata; nervis primariis lateralis (11)16–26 utroque. Pedunculus (20)33–60 cm longus; spatha oblongo-lanceolata, viridis, aliquando purpurea tincta, (9)12–30 cm longa, 1–1.7 cm lata; spadix purpureus extendens ad marrinonium, leniter contractus, 12–23 cm longus, 3–6 mm diametro. Baccae ignotae.

Usually epiphytic, sometimes terrestrial; stem to 60 cm long, 3.5–5 cm diam.; roots very dense, spreading-ascending, greenish to white, smooth, ca. 7–15 cm long, ca. 5 mm diam.; cataphylls subcoriaceous, lanceolate, straight or hooked, to 14 cm long, acuminate at apex, drying whitish to reddish brown, persisting as linear fibers. *Leaves* erect-spreading; petioles 7–15(25) cm long, ca. 10 mm diam., sharply D-shaped, somewhat flattened with a medial rib and sharply erect or acute margins adaxially, rounded and sometimes weakly 1–2-ribbed abaxially; geniculum moderately thicker and slightly paler than petiole, 1–3 cm long; blades coriaceous to subcoriaceous, oblanceolate to broadly oblanceolate-elliptic, acute to abruptly and shortly acuminate at apex, acute to broadly rounded or shallowly cordate at base, rarely narrowly acute, (60)90–125 cm long, 20–34 cm wide, broadest above the middle, the margins moderately undulate; upper surface semiglossy, medium green (B & K yellow-green 2/7.5), lower surface weakly glossy, moderately paler; midrib convexly raised to prominently 1-ribbed at base, becoming acutely raised toward the apex above, moderately paler than surface, convexly raised and conspicuously paler than surface below; primary lateral veins (11)16–26 per side, departing midrib at 40–50(60)° angle, straight-ascending to very near the margin, then arcuate, frequently congested at base, convexly raised above, less conspicuously so below, paler than surface; interprimary veins usually present toward the apex and base of the blade; tertiary veins rather obscure above, less so below, drying conspicuously raised on both surfaces; reticulate veins prominulous on drying; collective vein arising from near the apex or absent, rather obscure on both surfaces, to 8 mm from margin. *Inflorescences* erect; peduncle (20)33–60 cm long, 3–5 mm diam., 3–6 × as long as petioles, terete; spathe reflexed, subcoriaceous, green, sometimes tinged with purple, oblong-lanceolate, (9)12–30 cm long, 1–1.7 cm wide, broadest near the base, acuminate at apex, obtuse at base; spadix dark to dull purple to maroon, sessile or stipitate to 4 cm, cylindroid, slightly tapered, somewhat curved, held at 30–50° angle from peduncle, 12–23 cm long, 5–6 mm diam. near base, 3–4 mm diam. near apex, broadest at the base; flowers rhombic, 1.2–2.5 mm long, 1.2–1.6 mm wide, the sides smoothly sigmoid; 6–9 flowers visible in principal spiral, 4–5(8) in alternate spiral; tepals muricate; lateral tepals 0.7–1.5 mm wide, the outer margins 2-sided, the inner margins nearly straight to rounded; pistils yellowish when dried; filaments (dried) exserted for 0.2–0.3 mm, 0.3–0.7 mm wide; anthers pinkish, 0.3–0.4

mm long, 0.4–0.5 mm wide; thecae ovate, slightly or prominently divaricate.

Anthurium asplundii is endemic to coastal Ecuador in Esmeraldas, Los Ríos, and Pichincha provinces, where it occurs from near sea level to 400 m in tropical dry, tropical moist, and premontane wet forest life zones.

This species is distinguished by its short petioles, its large, oblanceolate leaf blades which are frequently rounded to subcordate at the base and often dry green (sometimes yellowish brown), and by its purple to maroon, often stipitate spadix.

Though sometimes terrestrial, this species is usually epiphytic and in coastal Ecuador can only be confused with *A. barclayanum*. The latter occurs further to the south in mostly drier life zones, and the more narrowly oblanceolate leaves are held in an open rosette, whereas in *A. asplundii* they may overlap in the lower portion and form a tight "bird's nest" rosette. In addition, the blades of *A. barclayanum* are usually strongly undulate, much more so than in the present species, and the cataphyll is cucullate (vs. lanceolate and straight or hooked in *A. asplundii*). The spadix color of *A. asplundii* is dark purple to maroon, and in *A. barclayanum* it is usually greenish.

A species which is remarkably similar in overall appearance to *A. asplundii* is *A. harlingianum*, from the eastern foothills of the Andes, mostly in Ecuador. It differs mainly in its spadix color (dark salmon-pink to pale violet-purple vs. maroon to dark purple in *A. asplundii*) and in having leaves that dry mostly dark brown rather than greenish. The disjunct distribution suggests that the two are remotely related.

An interesting collection is *Dodson & Embree 13097*, from Borbón in northern Esmeraldas, for which the spadix color is reported as "gray-white." In the dried state it is brown, not dark maroon as in other specimens. It otherwise agrees well with *A. asplundii*. Another somewhat aberrant plant is *Harling 4465*, from the Río Blanco in Pichincha, with the geniculum 3 cm remote from the base of the leaf blade.

The species is named in honor of Erick Asplund, the first Swedish botanist to collect for the Flora of Ecuador project and the first to collect *A. asplundii*, in 1955.

ECUADOR. ESMERALDAS: without locality, less than 300 m, *Cobb 44* (MO); 20 km S of Esmeraldas, Hacienda Guayas, *Sparre 15366* (S); Esmeraldas airport–San Mateo, 4.1 km N of bridge over Río Esmeraldas, near sea level, 0°54′N, 79°38′W, *Croat 55586* (CM, QCA, MO, US, NY); Esmeraldas–Sua, 6.4 km N of Río Sua, 29.4 km SW of jct. with road to Esmeraldas, 40 m, 0°52′N, 79°52′W, *Croat 55598* (MO, QCA); Santo Domingo de los Colorados–Esmeraldas, 62 km N of Quinindé, 80 km SE of Atacames, 270 m, 0°35′N, 79°33′W, *Croat 55580* (MO, QCA, NY, RSA); 8.8 km NW of Quinindé, 270 m, 0°26′N, 79°03′W, *Croat 55554* (MO, QCA); 4.4 km SW of Sua, coastal road, 35.7 km SW of jct. with road to Esmeraldas, near sea level, 0°51′N, 79°53′W, *Croat 55608* (MO, QCA); Limones, sea level, *Christenson 1521* (MO); Río Cayapas, Playa Grande, 2 km SE of San Francisco de Cayapas, *Sparre 18039* (S); Zapallo Grande, 150 m, 78°55′W, 0°49′N, *Kvist & Asanza 40886* (AAU); Río Esmeraldas, opposite Quinindé (Rosa Zárate), *Asplund 16346* (S); Río Santiago, Borbón, 30 m, *Dodson & Embree 13097* (SEL); Río Verde, hill above Businga, 300 m, 1°00′N, 79°30′W, *Juncosa 801* (MO). LOS RÍOS: Río Blanco, Santo Domingo de los Colorados–Esmeraldas, 3 km S of Km 24, across river from Villa Hermosa, 250 m, 0°05′S, 79°15′W, *Croat 50685* (K, MO), *50688* (MO, K, QCA, US), *50693* (B, MO). PICHINCHA: 10 km NW of Santo Domingo de los Colorados, road to Esmeraldas, Rancho Brahman, 400 m, *Sparre 15210* (S); below confluence with Río Toachi, 200 m, *Harling 4465* (S); confluence of Río Napo and Río Pilaton, *Sodiro s.n.* (Q).

Anthurium atropurpureum R. Schultes & Maguire, Bot. Mus. Leafl. Harvard Univ. 16: 60. 1953.

a. **Anthurium atropurpureum** var. **atropurpureum**. TYPE: Colombia. Amazonas: Quebrada Agua Preta, *Black & Schultes 46-375* (holotype, GH). Figures 38, 44.

Terrestrial or rarely epiphytic; stem to 30 cm long, 1.5–2 cm diam.; roots mostly descending, 3–30 cm long, 2–4 mm diam.; cataphylls subcoriaceous to coriaceous, 1–7 cm long, narrowly acute at apex, drying pale brown (B & K yellow 5/2.5), persisting ± intact, sometimes as a reticulum of fibers with the apex remaining intact. *Leaves* ± erect; petioles 2–25 cm long, 2–8 mm diam., bluntly D-shaped or terete to subterete, obtusely or narrowly sulcate, sometimes weakly flattened adaxially, rounded abaxially, surface sometimes pale-speckled; geniculum thicker and paler than petiole, concolorous when dried, becoming fissured transversely with age, occasionally to 2.5 cm remote from the base of the blade, 0.5–1.5 cm long; blades subcoriaceous to coriaceous, mostly elliptic, often narrowly so, acuminate at apex (the acumen flat), attenuate or acute at base, 11–75 cm long, (3)5–14 cm wide, broadest at or near the middle, the margins flat to undulate; upper surface semiglossy to glossy, medium green, lower surface matte to semiglossy, sometimes paler, drying pale green; midrib convexly raised to angular at base, becoming narrowly raised toward the apex above, broadly acute at base below, becoming conspicuously and acutely raised to narrowly raised toward apex, paler than surface when dried; primary lateral veins 5–

11 per side, departing midrib at (30)50–60° angle, mostly arcuate-ascending, rarely straight to the collective vein, raised above, prominently convexly raised below; interprimary veins rarely present, etched above, flat below; tertiary veins visible, usually weakly etched above, prominulous and darker than surface below; collective vein arising from near the base or near the apex, sunken above, raised below, 5–10 mm from margin. *Inflorescences* erect, shorter than or equaling leaves; peduncle (8)15–47.5 cm long, 2–5 mm diam., 1.3–4× as long as petiole, terete; spathe spreading to reflexed, withering at anthesis, subcoriaceous, streaked with raphides when dried, green heavily tinged with purple at margins to purple-red throughout, lanceolate to linear-lanceolate, 2–15 cm long, 0.5–2.2 cm wide, broadest near base, inserted at 90° angle on peduncle, acute to narrowly acute at apex, acute at base; stipe 3–15 mm long in front, 2–8(12) mm long in back; spadix usually deep purple (B & K purple 2/7.5), sometimes maroon to brown, cylindroid to long-tapered, erect, 2–14 cm long, 3–8 mm diam. near base, 2–4 mm diam. near apex, broadest at the base; flowers rhombic or 4-lobed, 1.6–2.2 mm in both directions when fresh, 1.8–2.4 mm in both directions when dried, the sides ± straight or smoothly to jaggedly sigmoid, 4–8(10) flowers visible in either spiral; tepals matte, muricate, weakly to conspicuously and minutely papillate, the papillae maroon (B & K red-purple 2/2.5); tepal surface olive-green (B & K yellow 6/10); lateral tepals 0.6–1.5 mm wide, the inner margins straight to concave, the outer margins straight to weakly 4-sided; pistils emergent, raised, the exposed portion ± square, 0.6–0.7 mm in both directions, dark purple to green tinged with purple; stigma ellipsoid to oblong, 0.5–0.6 mm long, 0.2–0.3 mm wide, papillate, densely brushlike; stamens emerging rapidly from the base, in a ± scattered pattern, the laterals preceding the alternates by ca. 8 spirals, the 3rd stamen preceding the 4th by ca. 2 spirals, held against the pistil; anthers greenish yellow, 0.4–0.6 mm long, 0.5–0.8 mm wide; thecae ellipsoid, slightly divaricate; pollen yellow-orange, creamy when dried. *Infructescence* with spathe withered; spadix 4–13 cm long, the stipe 0–5 cm long; berries dark purple to deep red, globose to ellipsoid, 5–6 mm long, 4–6 mm diam.; pericarp dry, thickened with numerous raphide cells; seeds 2 or frequently 1 per berry, oblong-ellipsoid, 3.6–4.4 mm long, 1.8–2.4 mm diam., 1.2–1.4 mm thick, with a gelatinous appendage.

Anthurium atropurpureum ranges from southern Colombia to Brazil (Acre) and in western Bolivia, at low elevations (100 to 160 m) on white sand soils.

This species is distinguished by its leaf blades, with the tertiary veins conspicuously etched above (when fresh), by its adaxially sulcate petioles, and its purple, scarcely tapered spadix subtended by a purple-tinged spathe that withers at anthesis.

Anthurium atropurpureum is most easily confused with *Anthurium bonplandii.* A general distinction for dried material is the color of the leaf blades: yellowish/brownish and mostly concolorous for *A. bonplandii* (except subsp. *cuatrecasii*) vs. ± green and often bicolorous for *A. atropurpureum.* See further discussion under *A. bonplandii.*

Anthurium atropurpureum comprises three sympatric varieties. *Anthurium atropurpureum* var. *arenicola* is a forest epiphyte or an understory terrestrial herb and greatly exceeds the typical variety in size. Variety *thomasii* is endemic to the Serranía de Huanchaca in Bolivia (see that variety for differences). *Anthurium atropurpureum* var. *atropurpureum* ranges from southern Amazonas Dept. in Colombia to Maynas Province (Dept. Loreto) in Peru, as well as Acre and the eastern edge of Amazonas in Brazil, at low elevations in a tropical moist forest life zone. It is distinguished from var. *arenicola* by its much smaller leaves with the collective veins arising from near the base instead of from the upper ½ and to ⅓ of the blade. The varieties *atropurpureum* and *arenicola* share similar soil preference and geographical ranges, although the former is more often terrestrial.

BRAZIL. ACRE: Cruzeiro do Sul, near airport, *Ramos 136* (INPA). AMAZONAS: Rio Tontantins at Villa Velha, near Rio Solimoes, 2°53′S, 67°50′W, *Daly et al. 4341* (INPA, MO, NY). COLOMBIA. AMAZONAS: Amazonas–Putumayo watersheds, above 100 m, *Schultes 6905* (GH); Agua Preta, *Black & Schultes 46-375* (GH); La Chorrea Río Igara–Parana (affluent of Río Putumayo), *Sastre 3232* (COL). PERU. LORETO: Prov. Maynas, 140 m, *Rimachi 7343* (IBE, MO), *Ruiz & Murphy 188* (AAU, F, IBE, MEXU, MO, TEX); Alpahuayo, Estación IIAP, *Vásquez & Criollo 5759* (M, MO); 130 m, *van der Werff et al. 10212* (MO); Iquitos–Nauta, Km 32, 150 m, 4°10′S, 73°30′W, *Vásquez & Jaramillo 7847* (K, MO, US); 130 m, *Vásquez & Jaramillo 10558* (KRAM, MO); Iquitos, Carretera Quisto Cocha–Varillal, ca. 160 m, *McDaniel et al. 27447* (IBE, MO); Quisto Cocha road, near airport, 120 m, *Gentry & Daly 19118* (F, MO); 12–25 km S of Iquitos, *Croat 18279, 18405, 18183, 18665* (MO); Carretera Quisto Cocha–Nauta, 160–170 m, *McDaniel et al. 27605* (IBE, MO); Iquitos at Peña Negra, *Davidson 3659* (RSA); 100 m, *Ayala 1821* (AMAZ); Iquitos–Santo Tomas, S of Iquitos, *Croat 19104* (CAS, COL, F, MO, NY, RSA, SEL); Varillal, road to Nauta, 130 m, 3°45′S, 73°21′W, *Vásquez & Jaramillo 1197* (K, MO), *1198* (MO, RSA); Roca Fuerte (Momón), 160 m, 3°40′S, 73°30′W, *Vásquez & Jaramillo 5232* (MBM, MO); Carretera de Zungaro Cocha, near Shushana, 160 m, *Ri-*

machi 6566 (IBE, MO); near Villa Angel, 140 m, *Rimachi 5888* (IBE); Iquitos Region, Iquitos, Mishuyacu, 120 m, *Killip & Smith 29887* (NY, US), *Klug 316, 207* (F, NY, US); ca. 120 m, *Revilla 4295* (AMAZ); vic. Quista Cocha, 120–140 m, *Croat 51180* (GH, M, RSA, MO), *Gentry 20719* (MO), *Gentry & Ayala 15510* (MO), *Gentry & Jaramillo 22335* (MO), *McDaniel 13604* (MO); Río Amazonas, Dtto. Yanamono, Quebrada Yanamono, Explorama Camp, 150–180 m, 3°24′S, 72°49′W, *Croat 56927* (DUKE, MO, NY), *61761* (AMAZ, MO); Río Nanay, Picuruyacu, 160 m, *McDaniel & Rimachi 26371* (IBE); 30 km SW of Iquitos, Mishana, Estación Biológica Callicebus, 150 m, *Gentry et al. 15782* (B, MO, S); Mishana, *Rimachi 1239* (IBE); 30 km SW of Iquitos, Mishana, 120–150 m, *Foster 4217* (MO), *Gentry et al. 31671* (BM, K, MO), *36536* (MO, RSA), *Solomon 3548* (MO).

b. Anthurium atropurpureum var. **arenicola** Croat, var. nov. TYPE: Ecuador. Napo: road between Lago Agrio and Río San Miguel, 3 km N of Lago Agrio, 0°5′N, 76°50′W, 450 m, *Croat 50303* (holotype, MO 2828986; isotypes, AAU, B, BM, CAS, CM, COL, G, GH, IBE, INPA, K, NY, QCA, RSA, SEL, US, W). Figures 39, 40–42, 45.

Differt a var. typica pro ratione amplioris et distinctis habitationibus suis; et nervo collective prope basim exorienti.

Terrestrial or epiphytic; stem to 30 cm long, 1–3.5 cm diam.; leaf scars obscured by root mass and cataphylls, 1.5–2 cm wide; roots numerous, dense, mostly descending, uppermost ascending, gray or green, smooth to densely pubescent, elongate, blunt, 5–30 cm long, 3–6 mm diam.; cataphylls moderately thin to subcoriaceous, bluntly 1-ribbed near the apex, 5–12 cm long, narrowly acute to acute at apex, tinged with red, drying tan (B & K yellow-red 7/2.5), persisting with apex remaining intact, eventually deciduous. *Leaves* erect-spreading, rosulate or scattered along stem; petioles 4–63 cm long, 3–12 mm diam., erect, slightly thicker than broad to D-shaped, shallowly sulcate adaxially, sometimes obtusely V-sulcate, the margins moderately sharp, rounded abaxially, the surface pale-speckled, tinged with red near the base; geniculum markedly thicker than petiole, slightly paler, 1–3 cm long; blades coriaceous to subcoriaceous, narrowly to broadly oblanceolate, less often elliptic, acute to abruptly acuminate, sometimes gradually acuminate at apex (the acumen to 4 cm long, inrolled), long-attenuate or rarely acute at base, sometimes making geniculum seem remote, occasionally acute to obtuse, (16)45–80(100) cm long, 8–25(41) cm wide, broadest at or above the middle, the margins undulate; upper surface weakly glossy to glossy, medium green, lower surface semiglossy to matte, only slightly paler and mostly eglandular, rarely weakly pustulate, both surfaces drying green and paler below, matte; midrib flat at base, becoming acute-raised to convexly raised toward the apex above, higher than broad to prominently acute-raised below; primary lateral veins 5–13 per side, departing midrib at (30)40–65(70)° angle, usually weakly arcuate-ascending to the collective vein, sunken to convexly raised above, prominently and convexly raised below, paler than surface; interprimary veins etched above, weakly raised below, prominulous when dried; tertiary veins conspicuously etched above, flat to prominulous below; collective vein arising from about the middle or in the upper ⅓ of blade, sometimes arising in lower ½, sunken above, raised below, flat above when dried; antimarginal vein visible on live plant, running close to margin from the base; 1st collective vein 9–12 mm from margin. *Inflorescences* erect to spreading, shorter than or equaling leaves (rarely longer than leaves); peduncle (12)20–73 cm long, 2–8 mm diam., 1–4× as long as petiole, green to green heavily tinged with purple, terete; spathe spreading to reflexed and recurled or twisted, withering at anthesis, subcoriaceous, matte on both surfaces, pale to medium green, heavily tinged with red-violet, sometimes maroon to purple, lanceolate to narrowly lanceolate, 4–22 cm long, 0.6–2.5 cm wide, broadest near the base, inserted at 45° angle on peduncle, long-acuminate at apex, broadly acute, decurrent to 2 cm at base, the margins meeting at ca. 45° angle; spadix green (B & K yellow 5/7.5) heavily tinged with violet-purple, to dark purple or maroon, cylindroid to tapered, sessile or stipitate to 16 mm, erect, 4–26 cm long, 3–8 mm diam. near base, 3–5 mm diam. near apex, broadest at the base; flowers square to rhombic, 1.5–2.6 mm long, 1–2.5 mm wide, the sides straight to sigmoid, 5–8 flowers visible in principal spiral, 5–10 in alternate spiral; tepals matte, weakly to densely and minutely papillate, muricate, lateral tepals (0.5)0.8–1 mm wide, the inner margins pale, thin, pinkish, straight to weakly convex, the outer margins 2–3-sided; pistils weakly emergent before stamens emerge, ± square, green, developing a maroon tinge, sometimes somewhat papillate; stigma ellipsoid, 0.2–0.6 mm long, depressed medially, lightly or densely papillate, droplets appearing 7–11 days before anthesis; stamens emerging in a regular sequence from the base, lateral stamens followed by alternates in rapid succession (7 days), the laterals preceding the alternates by 5–10 spirals, held over and obscuring pistil, 3rd barely preceding 4th; anthers yellow, 0.2–0.6 mm long, 0.8 mm wide, held at edge of the pistil, only partially exserted; thecae oblong-ellipsoid, 0.2–0.4 mm wide, not divaricate or only slightly divaricate; pollen yellow fading to cream, faintly sweet- or yeasty-scented. *Infructescence* spreading to pendent; spathe withered or absent; spadix 14–35 cm long, 1–2.5 cm diam., bearing berries in the basal portion only, the stipe to 1.5 cm long.; berries white to greenish white basally, violet-purple in apical ½ (B & K purple 2/7.5), subglobose, rounded at apex, 6–8 mm long, 4–6 mm diam.; pericarp somewhat thickened, with raphide cells; mesocarp with raphides, thickly gelatinous; seeds 1–2 per berry, pale green becoming purple (B & K purple 3/2.5), oblong-ellipsoid, 3–6 mm long, 2–3 mm diam., 1.4–1.6 mm thick, with a basal mucilaginous appendage at radicle end.

Anthurium atropurpureum var. *arenicola* ranges from southern Colombia (Putumayo and Amazonas) to western Brazil (Amazonas, Acre, and western Rondônia), Ecuador (Morona Santiago, Napo, and Pastaza), Peru (Amazonas, Loreto, and Madre de Dios), and Bolivia (La Paz), at 100–560 m. It is principally found in tropical moist forest life zones, in mature forest on white sand soils (hence the name); the variety is both terrestial and epiphytic.

Anthurium atropurpureum var. *arenicola* is distinguished vegetatively by its mostly oblanceolate leaf blades, which dry greenish and often bicolorous and are usually long-attenuate with straight margins toward the base and acuminate at the apex. The spadix may be violet-purple or maroon, or green tinged (usually heavily) with these colors, and the spathe is withered at anthesis.

This variety is distinguished from the typical variety by its larger size and occurrence in the forest understory, commonly as an epiphyte, rather than as a terrestrial plant in open areas. It may be confused with the typical variety and var. *thomasii* (see discussion under both varieties). It may also be confused with *A. bonplandii* subsp. *bonplandii*; see discussion under that subspecies.

Variety *arenicola* is also similar to *A. fendleri*, but differs in having more coriaceous blades when dried, mostly long-attenuate leaf bases and long-acuminate apices, whereas *A. fendleri* is rounded or short-acuminate at the apex and mostly rounded to shortly cordate at the base.

BOLIVIA. LA PAZ: Prov. Iturralde. Río Beni, Luisita, 180 m, 13°05'S, 67°15'W, *Haase 343* (MO). BRAZIL. ACRE: Cruzeiro do Sul, Estrada Alemanha, *Prance et al. 11819* (INPA, NY); near airport, *Monteiro & Damião 315* (INPA); NW of Cruzeiro do Sul toward Barão do Rio Branco, 4 km NW of São Francisco, 150 m, 7°36'S, 72°37'W, *Croat & Rosas 62694* (AAU, BM, CM, INPA, MO, NY); *Mutis 48* (US); Cruzeiro do Sul–Rio Branco, 44 km E of Cruzeiro do Sul, Fazenda da Dona Cabuca, 150 m, 7°38'S, 72°35'W, *Croat 62330* (INPA, MO, NY); vic. airport, 150 m, 7°38'S, 72°36'W, *Croat & Rosas 62642* (CM, INPA, MO, NY). AMAZONAS: Casauari, NW of Rio Jurua, *Silva et al. 392* (NY, US); Rio Aripuana, Nova Prainha, SB20-ZD Point 5, *Mota s.n.* (INPA); Rio Javari, Estiraõ de Equador, *Lleras et al. 17265* (INPA, NY); Paumari, above Atalaia, *Prance et al. 23788* (INPA); Rio Urubu, above Iracema, *Prance et al. 4969* (INPA); Mpo. Humaitá, Humaitá–Porto Velho, Km 60, 08°05'S, 63°W, *Texixeira et al. 187* (INPA, NY); Rio Madeira, Tres Casas, *Krukoff 6549* (NY); Mpo. Novo Aripuanã, BR 230, Rodovia Transamazonica, at km 300 from Humaitá, 4°33'S, 60°40'W, *Ferreira 5711* (INPA, NY); Rio Madeira basin, Rio Livramento, Livramento, *Krukoff 6771* (NY). RIO DE JANEIRO: (cultivated by R. Burle-Marx) San Carlos, *Croat 53698* (CM, MO, GUA, NY). RONDÔNIA: Porto Velho–Ariquemes, 4 km N of Ariquemes, *Croat 53582* (MO); Serra dos Tres Irmãos, opposite Mutumparana, N bank of Rio Madeira, *Prance et al. 5535* (COL, INPA, NY, US). COLOMBIA. AMAZONAS: Río Igara–Paraná, Puerto Buenaventura, *Sastre 2449* (US). PUTUMAYO: Río San Miguel and Sucumbios: Conejo, 300 m, *Schultes 3535* (GH). ECUADOR. MORONA–SANTIAGO: El Centro Shuar Kanhaim, (Cangaimine), Río Kankaim (Cangaime), 20 km WNW of Taisha, 500 m, 77°41'W, 02°20'S, *Shiki RBAE207* (NY). NAPO: Lago Agrio-Baeza, 43 km E of Lago Agrio, km 43, 560 m, 0°07'N, 77°15'W, *Croat 50441* (MO); Lago Agrio–Coca, 69 km S of Lago Agrio ferry crossing over Río Coca, 200 m, *Gentry 12558* (MO); Lago Agrio–Río San Miguel, 3 km N of Lago Agrio, 450 m, 0°05'N, 76°50'W, *Croat 50303* (AAU, B, BM, CAS, CM, COL, DUKE, F, G, GB, GH, IBE, INPA, K, LE, M, MO, NY, OOM, QCA, RSA, SAR, SEL, TEX, US, W); 21.2 km N of Lago Agrio, road near Río San Miguel, 470 m, 0°08'N, 76°50'W, *Croat 50358* (AAU, B, CM, K, KYO, L, LE, MBM, MO, QCA, RSA, SEL, US); Puerto El Carmen de Putumayo–Lago Agrio, 76 km E of Lago Agrio, Tarapoa, 240 m, 0°07'N, 76°23'W, *Croat 58630* (MO); Cantón Aguarico, Parque Nacional Yasuní, Iagunas de Garza Cocha, 200 m, *Cerón & Gallo 5006* (MO, QCNE); Río Aguarico–Coca, 8 km S of Río Aguarico, E of Lago Agrio, *Croat 58514* (CM, MO, QCA); Río Aguarico, 300 m, 0°15'S, 76°21'W, *Brandbyge et al. 33207* (AAU); Cantón Putumayo, Dureño, 500 m, *Plowman et al. 4048* (GH); Santa Cecilia, 220 m, 0°4'S, 76°58'W, *Sparre 13022, 13128* (S); Río Aguarico–Coca, Lago Agrio, S side of lake, 5 km NW of town, 280 m, 0°05'N, 76°55'W, *Croat 58683* (MO), *58687* (K, MO, QCA); Lagunas de Cuyabeno, 300 m, 0°01'S, 76°11'W, *Brandbyge et al. 33975, 36010* (MO, AAU); Reserva de Producción Faunística Cuyabeno, 265 m, *Poulsen 78992* (AAU); S of Laguna Garzacocha, 76°11'W, 00°01'S, *Balslev et al. 84689* (AAU); Laguna Cañangueno, 76°11'W, 00°01'S, *Balslev et al. 84903* (AAU, MO); Río Napo, 20 km downstream from Coca, Laguna Taracoa, 250 m, *Besse et al. 1962* (SEL); SW of Puerto Francisco de Orellana, 300 m, 0°32'S, 77°0'W, *Balslev & Madsen 10621* (AAU); Lago Agrio–Coca, 15 km N of Coca (Francisco de Orellano), 350 m, *Croat 50411* (IBE, MO, P, U); Río Suno, 1 mi. above confluence with Río Napo, 290 m, *Whitmore 860* (K, NY); Coca, Texaco landing strip, 300 m, *Foster 3557* (F, MO); Limoncocha, 240 m, *Madison et al. 5330* (MO, SEL); Río Yasuní, 80 km upriver from Rocafuerte, 225 m, *Foster 3735* (F, MO, QCA); Lagunas Jatun-Cocha, 200 m, *Cerón & Gallo 5145* (MO, QCNE), Cantón Lago Agrio, Dureño, 350 m, 0°2'S, 76°42'W, *Cerón 346* (MO); Reserva Indígena Cofan-Dureño, *Cerón & Cerón 3152* (MO); Estación Biológica Jatún Sacha, Río Napo, 8 km E of Misahuallí, 01°4'S; 77°36'W, 450 m, *Cerón 1729* (MO, QCNE). PASTAZA: Laguna Garzayacu, 250 m, 1°29'S, 76°39'W, *Neill & Palacios 6707* (MO); Río Curaray, Lorocachi, 200 m, 1°38'S, 75°58'W, *Jaramillo et al. 31325* (AAU, MO). PERU. AMAZONAS: Río Santiago, 2–3 km from community of Caterpiza, 65 km N of Pinglo, Quebrada Caterpiza, 200 m, *Huashikat 2216* (MO). LORETO: Río Corrientes, upriver from Tnte. Lopez oil camp, almost at Ecuador border, 280–300 m, *Gentry et al. 18975* (MO); Dtto. Pebas, Río Yaguasyacu, Bora native community of Brillo Nuevo, 150 km ENE of Iquitos, 106 m, 3°0'S, 72°05'W, *Treacy & Alcorn 107* (WIS), *165* (F, WIS); Prov. Loreto, Nauta, 160 m, 4°32'S, 73°35'W, *Vásquez & Jaramillo 5092* (MO, RSA), *5095* (MO, VEN); Prov. Maynas, Dtto. Iquitos, road to Zungaro Cocha, 140–160 m, *Rimachi 5882, 5905, 6352, 7172* (IBE); Carretera Peña Negra, 4 km beyond Quisto Cocha, ca. 150, *McDaniel & Rimachi 25741* (IBE), *Rimachi 6421* (IBE, MO); Nina Rumi, 130 m, *McDaniel et al. 27489* (IBE); Iquitos Region, 17 km SW of Iquitos, *Croat 18393, 18506* (MO), *18460* (MO, USM); Quisto Cocha, 120 m, 3°47'S, 73°24'W, *Croat 51179* (C, K, MISSA, MO, SEL), *51180* (BM, GH, M, MO, US), *51182* (MO), *Rimachi 8086* (IBE); road to Picuruyacu, 160 m, *McDaniel et al. 24770* (MO), *Rimachi 5465* (IBE); Río Itaya, Cahuide, *Vásquez & Jaramillo 5644, 5686* (MO), below mouth of Río Ucayali, 130 m, 4°20'S, 72°30'W, *Gentry et al. 30041* (MO); San Antonio, 150 m, 4°10'S, 73°20'W, *Vásquez & Jaramillo 3537* (MO); Puerto Almendras, 120 m, 3°48'S, 73°25'W, *Croat 19048* (MO), *Croat 51216* (BM, CM, MO, US, W); 12 km SW of Iquitos, *Croat 20093* (MO); 130 m, *van der Werff et al. 9778* (MO); 122 m, 3°48'S, 73°25'W, *Vásquez & Jaramillo 4595, 4949, 6099, 6849, 11485* (MO); 5 km from Río Nanay, *Croat 18560* (F, MO, NY, USM); Iquitos–Nauta, Km 44, 150 m, 4°10'S, 73°20'W, *Vásquez et al. 1942* (MO); Mishana–Río Nanay, Estación Biologíca Callicebus, 130 m, 3°55'S, 73°35'W, *Vásquez et al. 643* (MO), *Vásquez & Jaramillo 8934* (MO); Indiana–mouth of Río Napo, Explorama Tourist Camp, Yanamono, 130 m, 3°28'S, 72°48'W, *Croat 61761* (AMAZ, MO), *Gentry et al. 31422, 39695* (MO), *Vásquez et al. 5170, 5179* (MO); Río Momón, *Rimachi 5815* (IBE); Santa Maria de Nanay, Quebrada Yarina, 150 m, 3°55'S, 73°40'W, *Vásquez & Jaramillo 12221* (MO); Río Nanay, Iquitos–Sta. María de Nanay, Maynas, 140 m, 3°52'S, 73°30'W, *Gentry & Emmons 38783* (F, MO), *Gentry et al. 39345* (MO); Iquitos–Sta. María de Nanay, Mishana, *Gentry et al. 28857, 28858, 31715, 26538* (MO), *Gentry & Aronoson 25300* (MO); Río Napo, near Paco Cano, 120 m, *Diaz & Jaramillo 1547* (MO); Altura Tutapisco, 3°02'S, 73°15'W, *Croat 20310* (MO); Explorama Llachapa Camp, Quebrada Sucusari, below Mazán, 140 m, *Gentry et al. 27731* (MO); Quebrada Paparo, 110 m, 3°45'S, 72°55'W, *Vásquez & Jaramillo 11689* (MO); Río Yaguasyacu, tributary of Río Ampiyacu, Brilla Nueva, *Gentry & Revilla 20433* (MO); Prov. Ramón Castilla, Río Ampiyacu, trail from Pucaurquillo, upriver from Pebas, 140 m, 3°15'S, 71°56'W, *Stein et al. 4006* (MO); Prov. Requena, Jenaro Herrera, 170 m, 4°50'S, 73°45'W, *Vásquez et al. 2154, 11865* (MO); 140 m, *van der Werff et al. 10015* (MO). MADRE DE DIOS: serranía across Río Alto Madre de Dios, Pantiacolla, 480–840 m, *Gentry et al. 27357* (MO).

Anthurium atropurpureum var. **thomasii** Croat. var. nov. TYPE: Bolivia. Santa Cruz: Prov. Velasco, Serranía de Huanchaca, Parque Nacional "Prof. Noel Kempff Mercado," 13°59'S, 60°43'W, rocky hills E of airport, ca. 750 m, *Thomas et al. 5696* (holotype, MO 3583031; isotypes, K, LPB, NY, University G. N. Moreno, Santa Cruz), Figure 352.

Differt a var. typico lamina ovato-elliptica, rotundata ad basim.

Terrestrial; stem short; internodes short, to 2 cm diam.; roots densely compacted. *Leaves* erect-spreading; petioles 7–20 cm long, to 6 mm diam. (dried), subterete, sulcate adaxially, rounded abaxially; blades moderately coriaceous, ovate-elliptic, rounded to obtuse and apiculate at apex, rounded to broadly obtuse at base but sometimes ending abruptly on the petiole and weakly decurrent, 35–50 cm long, 15–27 cm wide, broadest at or below middle; both surfaces drying matte to weakly glossy, pale yellowish green to gray-green, inconspicuously pustular but not glandular; midrib convexly raised on both sides; primary lateral veins 6–10 per side, departing midrib at 35–70° angle, at least those near the base of the blade arising at an acute angle with the midrib, arcuate-ascending to margin in a broad curve, most of them merging with the margin above the middle of the blade; interprimary veins lacking; tertiary veins prominulous on both surfaces; collective vein usually lacking, sometimes arising from below the middle of the blade and loop-connecting the primary lateral veins, 12–20 mm from margin. *Inflorescences* ± erect, equaling or much longer than leaves; peduncle 52–73 cm long; spathe spreading to spreading-reflexed, thinly coriaceous, soon drying, green, linear-lanceolate, 6.5–11 cm long, (0.9)1.2–1.6 cm wide, broadest above point of attachment, inserted at ca. 70° angle on peduncle, acuminate at apex, acute at base and sometimes decurrent on the peduncle to 1.3 cm; spadix brownish purple, sessile to subsessile, moderately tapered, erect, 6.5–9.5 cm long, (drying) 5–6 mm diam. near base, 4 mm diam. near apex, broadest at the base; flowers square to rhombic, 1.7–2 mm long, 1.6–1.8 mm wide, the sides straight parallel to spiral, smoothly to jaggedly sigmoid perpendicular to spiral, 9–11 flowers visible in principal spiral; tepals matte, minutely papillate, densely covered with a frostlike grayish coating which can be scraped off; lateral tepals 1–1.2 mm wide, the inner margins rounded, often turned up on drying, the outer margins 2-sided; pistils not at all emergent, obscured by anthers; stamens emerging in a regular sequence from the base, lateral stamens emerging up to 10 spirals before alternate stamens emerge, the 3rd stamen preceding the 4th by ca. 5 spirals; anthers 0.6 mm long, 0.7 mm wide, contiguous, inclined over pistil; thecae ovoid, moderately divaricate. *Infructescence* to 14 cm long, 1.5 cm diam., bearing berries in the basal portion only; berries purple on upper half, white below, obovoid-ellipsoid, rounded at apex, 6.5–8 mm long, 4–5 mm diam.; seeds 1 per berry, dark brown on rehydration, slightly flattened, 4.5–5 mm long, 3.5 mm diam., lacking any obvious appendage.

Anthurium atropurpureum var. *thomasii* is endemic to the Serranía de Huanchaca near the eastern border of Bolivia, known only from the type specimen collected in Santa Cruz Department in a region of tropical moist forest at ca. 750 m elevation. The type locality is an outlying upland area of the Brazilian shield with "cerrado" and "campo rupestre" vegetation, most closely related to that of adjacent Mato Grosso (W. Thomas, pers. comm.). The population of plants from which the type was collected was growing on steep, dry slopes in a relatively mesic area near a stream in both sunny areas and in partial shade (W. Thomas, pers. comm.).

The taxon is distinguished by its narrowly ovate-elliptic blades which dry pale green and are rounded basally. Also distinctive is the long-pedunculate inflorescence with a lanceolate spathe which is three or more times broader than the purplish spadix. The typical variety as well as the var. *arenicola* are both distinguished from var. *thomasii* by typically having attenuate to narrowly acute blade bases.

The new taxon is named in honor of Wayt Thomas, New York Botanical Garden, who made the only known collection of this taxon and who supplied valuable data on the ecology.

BOLIVIA. SANTA CRUZ: Velasco, Serranía de Huanchaca, Parque Nacional "Prof. Noel Kempff Mercado," 750 m, 13°59′S, 60°43′W, *Thomas 5696* (K, LPB, MO, NY).

Anthurium barclayanum Engl., Pflanzenr. IV 23B(Heft 21): 79. 1905. TYPE: Ecuador. Manabí: Isla Salango, *Barclay 646* (holotype, BM). Figures 14, 46–49, 59.

Terrestrial or epiphytic; stem to 40 cm long, 3–5 cm diam.; roots dense at the nodes, spreading-ascending, green to greenish white, fuzzy, ca. 7 cm long, 4–8 mm diam.; cataphylls subcoriaceous, 3.5–4.5 cm long, cucullate, rounded at apex, drying tan to brown, persisting ± intact or as fine linear fibers. *Leaves* erect-spreading; petioles 5–21 cm long, (5)7–15(20) mm diam., ± D-shaped, flattened or convex with sharp, erect margins and an acute or obtuse medial rib adaxially, obtusely angled, usually 1–4-ribbed abaxially; geniculum slightly paler and thicker than petiole, 1–7 cm long; blades subcoriaceous, narrowly oblong-oblanceolate to oblanceolate-elliptic, obtuse to acute and apiculate at apex, narrowly acute, sometimes abruptly obtuse, less often broadly rounded at base, (40)70–137 cm long, (7)11–32(48) cm wide, broadest above the middle, the margins strongly to moderately undulate; upper surface matte to semiglossy, medium green, lower surface matte to semiglossy, scarcely paler; midrib obtusely raised or flattened with a blunt medial rib at base, becoming acute toward the apex, same color as or paler than surface above, broadly and acutely raised at base, becoming convexly raised toward apex below; primary lateral veins 11–25 per side, departing midrib at 40–60° angle, straight- or arcuate-ascending to the margin, obtusely raised and nearly same color as surface above, convexly raised and paler than surface below; tertiary veins slightly raised, same color as surface above, slightly raised and darker than surface below; collective vein arising from near the apex, prominulous on both surfaces, ca. 5 mm from margin. *Inflorescences* spreading, sometimes erect; peduncle (20)40–80 cm long, (3)5–7 mm diam., 3.5–6(9)× as long as petioles, green to green heavily tinged with maroon, terete; spathe spreading to reflexed-recurled, coriaceous to subcoriaceous, green (sometimes tinged with violet-purple) to dark violet-purple or maroon, narrowly ovate to oblong-lanceolate, (4)7–24 cm long, 0.6–4 cm wide, broadest near the base, inserted at 30–70° angle on peduncle, acuminate at apex (the acumen inrolled), acute to subcordate at base; spadix usually brownish or olive-green to greenish yellow, sometimes reddish to violet-purple, sessile, cylindroid, slightly tapered, erect, usually somewhat curved, held at 140° angle from peduncle, (5)8–18 cm long, 5–10 mm diam. midway, 3.5–5 mm diam. near apex, broadest at the base; flowers 4-lobed, 1.2–2.5 mm long, 1.6–2.5 mm wide, the sides straight to sigmoid, 7–11 flowers visible in principal spiral, 6–7 in alternate spiral; tepals matte, weakly to moderately papillate; lateral tepals 0.8–1.4 mm wide, the inner margins straight to broadly rounded, the outer margins irregularly 3–4-sided; pistils emergent or not, reddish violet to dark purple or green; stigma linear to elliptic, 0.6–1 mm long; stamens emerging in a regular or scattered pattern, the laterals preceding the alternates by ca. ½ length of the spadix, the 3rd stamen preceding the 4th by ca. 15 spirals, arching over and obscuring pistil; anthers purplish violet to pinkish tan, 0.6–0.8 mm long, 0.8–0.9 mm wide; thecae oblong-ellipsoid to ovoid, slightly divaricate; pollen pale yellow to creamy, fading to white, spicy-scented. *Infructescence* spreading; spadix (6)14–28 cm long, 2 cm diam., greenish when young; mature fruits unknown; berries reddish brown, obovoid, 8–9 mm long, 4–5 mm diam.; seeds 5–6 mm long, 2.5–2.7 mm diam., 1.3–1.5 mm thick, with a gelatinous appendage at each end.

Anthurium barclayanum occurs in coastal Ecuador in El Oro, Manabí, and Guayas provinces, and in adjacent Tumbes Dept., Peru, from sea level to 890 m, in premontane moist, premontane dry, and very dry tropical forest life zones, as well as in tropical desert scrub. It is expected to be in tropical dry forest.

This species is characterized by its large, usually strongly undulate leaf blades, the usually greenish spadix and by its occurrence in dry habitats. *Anthurium asplundii*, its closest ally, occurs in adjacent Esmeraldas and Pichincha provinces in less dry life zones. Another close ally is *A. linguifolium*, which is sympatric with *A. barclayanum* in at least one locality, where *A. barclayanum* is epiphytic and *A. linguifolium* terrestrial in open areas. See those species for distinguishing characters.

In the southern part of its range, in El Oro Province, the spadix color of *A. barclayanum* is sometimes violet-purple, but these plants (e.g., *Croat 50711, 50712*; *Thompson 362*) otherwise agree well with other specimens. An intergradation with *A. asplundii* (with spadices maroon to purple) is conceivable, but the aberrant specimens of *A. barclayanum* occur in the part of its range furthest from *A. asplundii*, well separated by typical material with greenish spadices.

One collection (*Iltis & Mohr 234*) shows the odd character of having the tepals colored like the pistils, shriveled and very inconspicuous (compared to the pistils) in early fruit, whereas in all other specimens at apparently the same stage (or very near) the tepals are pale and conspicuous and not as shriveled.

ECUADOR. EL ORO: Avenillas–Piñas, 03°40′S, 79°45–55′W, *Thompson 362* (CAS, CM, GH, MO, RSA, UCLA); Machala–Loja, 1 km SE of La Avareada, 18 km NW of Saracay, 80 m, 04°25′S, 79°55′W, *Croat 50711* (C, MO, P, QCA); 25 km SE of jct. to Pinas, 890 m, 04°15′S, 79°45′W, *Croat 50712* (BM, M, MISSA, MO, OOM, QCA); 7.6 km from Tahuir, road to Piedras, 100 m, *Thompson 132* (MO). GUAYAS: Manglaralto–La Rinconada, *Harling et al. 20777* (GB). MANABÍ: Isla Salango, 01°36′S, 80°52′W, *Barclay 646* (BM); Jipijapa–Puerto López, 5 km S of Punta Cayo, 150 m, 01°25′S, 80°42′W, *Croat 50708* (B, CAS, K, M, MBM, MO, NY, RSA, SAR, SEL, US, W); N of San Vicente, farm road E of Hda. Napo (Hotel de la Playa), 50 m, *Croat 50702* (B, CAS, CM, F, GH, IBE, K, MO, OOM, QCA, U), *Iltis & Mohr 234* (WIS, QCA); MANABÍ–GUAYAS: Puerto López–Río Ayampe, 01°33–45′S, 80°40′W, *Thompson 373* (MO, SAR). PERU. TUMBES: Prov. Zarumilla, Dtto. Matapalo, Cerro Tres Picos, El Caucho–Figueroa, 3–4 km on trail from Figueroa, Campo Verde road, 550 m, *Simpson & Schunke 394* (F).

Anthurium basirotundum Croat, sp. nov. TYPE: Peru. San Martín: Tarapoto, above Hotel Turista, 400 m, cultivated at SEL (# 86-1976-2), *Plowman 5980A* (holotype, MO 2727371; isotype, SEL). Figures 50–52.

Internodia brevia, 2–3 cm diam.; cataphyllum lanceolatum, persistens fibris subtilibus et reticulatis; petiolus 5–24 cm longus, 3–5 mm diam., D-formatus aut plus minusve triangulatus, adaxialiter complanatus, marginibus acute elevatis; lamina ovata-elliptica, (15)19–41 cm longa, 6–17 cm lata, basi acuta, obtusa, rotundata vel subcordata; nervis primariis lateralis (3)4–8 utroque. Pedunculus (17)26–36 cm longus; spatha oblonga-lanceolata, 2–6.2 cm longa, 1.2–1.8 cm lata; spadix 3.5–9 cm longus, violaceus ad purpurascens. Bacca ovoidae, 4.5–5 mm longae, vinosae.

Stem to 12 cm long, 2–3 cm diam.; leaf scars obscured by cataphylls, 0.8–1 cm high, 1.4–1.7 cm wide; roots numerous, descending to spreading, green, scurfy, weakly pubescent, slender and elongate, 10–11 cm long, 3–5 cm diam.; cataphylls subcoriaceous, lanceolate, 3–7 cm long, rounded at apex with a subapical apiculum, green tinged reddish, drying tan to brown (B & K yellow 6/5), persisting as a reticulum of fibers with apex remaining intact, eventually deciduous. *Leaves* erect-spreading; petioles 5–24 cm long, 3–5 mm diam., D-shaped to somewhat triangular, flattened, sometimes with a medial rib adaxially, the margins sharply raised, rounded to obtusely 1-ribbed abaxially, surface sometimes minutely pale-speckled; geniculum slightly thicker than petiole, ca. 0.7 cm long; blades subcoriaceous, ovate-elliptic, acute at apex (the acumen slightly inrolled), acute to obtuse to usually semirounded to subcordate (sometimes acute to obtuse) at base, (15)19–41 cm long, 6–17 cm wide, broadest at or below the middle, the margins broadly undulate; both surfaces matte to semiglossy, dark to medium green above, somewhat paler below, brown to green on drying; midrib acutely raised at base, becoming flat toward the apex above, prominently convex at base and slightly paler than surface below; primary lateral veins (3)4–8 per side, departing midrib at 45–50° angle, weakly arcuate-ascending, slightly acutely raised above, somewhat convexly raised below; interprimary veins obscure; reticulate veins obscure; collective vein arising from near the base or in the upper ⅓ of blade, weakly sunken above, raised below, 5–10 mm from margin. *Inflorescences* erect to erect-spreading; peduncle (17)26–36 cm long, (2)3–5 mm diam., 1.5–7.7× as long as petioles, green tinged with red-violet or purple, terete, sometimes sulcate; spathe reflexed-spreading or sometimes recurled, subcoriaceous to coriaceous, deep red-violet to dark purple (B & K purple 2/7.5), oblong-lanceolate, 2–6.2 cm long, 1.2–1.8 cm wide, broadest near the base, inserted at 30–35° angle on peduncle, abruptly acuminate to cuspidate at apex (the acumen inrolled), rounded to obtuse at base, the margins meeting at 180° angle; spadix red-violet to violet-purple (B & K purple 2/7.5), tapered to somewhat cylindroid, sessile, erect, straight, 3.5–9 cm long, 5–9 mm diam. near base, 3–4 mm diam. near apex, broadest at the base; flowers ± square to rhombic or 4-lobed, 2.2–3.2 mm long, 2.1–3.5 mm wide, the sides straight to smoothly sigmoid, 5–6 flowers visible in principal spiral, 8–9 in alternate spiral; tepals smooth to weakly papillate, matte, weakly punctate; lateral tepals 1–2 mm wide, the inner margins ± straight to convex, the outer margins 2-sided; pistils emergent, dark red-violet; stigma ellipsoid to linear, 0.5–0.7 mm long, brushlike; stamens emerging in a regular sequence from the base, laterals emerging almost to the apex before alternates emerge; filaments exserted, ca. 0.5 mm, 0.6 mm wide; anthers reddish to purple-violet, 0.4–0.8 mm long, 0.6–1 mm wide, inclined over the pistil; thecae ellipsoid to oblong, 0.3 mm wide, not divaricate; pollen cream-yellow (B & K yellow 9/2.5), fading to white. *Infructescence* with spathe persisting; spadix 4.3 cm long, 0.9 cm diam.; berries deep wine-red, ± ovoid, rounded at apex, 4.5–5 mm long, 3–3.5 mm diam.

Anthurium basirotundum is known only from Peru in San Martín Department in the vicinity of Tarapoto in a tropical dry forest life zone at 400 m.

This species is characterized by its small overall size, leaf blades which are broadest generally below the middle and usually rounded to subcordate at base, and by its long-pedunculate inflorescence with a tapered, red-violet to violet-purple spadix and deep wine-red berries.

Anthurium basirotundum is probably most closely related to *A. tarapotense*, which occurs in the same area. The latter differs mainly in its elliptic-oblanceolate leaf blades which are attenuate to long-attenuate (rarely acute) at the base.

The species is named for the leaf blades, which are usually rounded to subcordate at the base.

PERU. SAN MARTÍN: Tarapoto, above Hotel Turista, 400 m, cultivated at SEL (#81-1976-2), *Plowman 5980A* (MO, SEL).

Anthurium bonplandii Bunting, Acta Bot. Venez. 10: 267–268. 1975.

a. **Anthurium bonplandii** subsp. **bonplandii**. TYPE: Venezuela. Amazonas: Dept. Atures, Río Orinoco near Siquita, between Isla Castillito and San Fernando de Atabapo, 100–140 m, *Bunting et al. 3676* (holotype, MY). Figures 53–55.

Anthurium atropurpureum var. *apertum* R. E. Schultes, Bot. Mus. Leafl. Harvard Univ. 16: 180. 1951. TYPE: Colombia. Amazonas: Jerijerimo, Río Apaporis, *Schultes 12094* (holotype, GH).
Anthurium bonplandii Bunting subsp. *rionegrense* Bunting, Phytologia 64: 459, figs. 1, 2. 1988. TYPE: Venezuela. Amazonas: Dept. Río Negro: San Carlos de Río Negro, 125 m, *Steyermark & Bunting 102741* (holotype, MO).

Terrestrial, rarely epilithic or epiphytic; stem 10–20 cm long, 1–4 cm diam.; roots descending and spreading, sometimes ascending when epiphytic and forming a globose "ant garden," grayish brown when dried and with raphide cells, reportedly with velamen, 5–28 cm long, drying 3–5 mm diam.; cataphylls subcoriaceous, 2–13 cm long, acute at apex, green, drying pale brown, persisting intact or as weathered fibers, once reported to be deciduous. *Leaves* erect-spreading; petioles (6)10–35 cm long, 3–20 mm diam., D-shaped, often broader than thick, flattened to broadly concave and occasionally with a medial rib adaxially, rounded to 4-ribbed abaxially; geniculum slightly thicker than petiole, 0.5–1.5 cm long, sheathing in lower ⅓ to ⅛ of the petiole; blades coriaceous, elliptic to broadly elliptic, rarely somewhat oblanceolate, acute to acuminate at apex (the acumen ± flat or slightly inrolled), usually acute to attenuate (sometimes barely rounded) at base, (10)30–75(100) cm long, (5)10–30(40) cm wide, broadest at or near the middle, the margins usually flat; upper surface glossy to semiglossy, dark green, lower surface ± matte, paler, usually pustular or glandular-punctate; midrib prominently convex above and below, somewhat raised on both surfaces when dried, glossy, paler than surface below; primary lateral veins (6)7–10(15) per side, departing midrib at (25)45–70° angle, usually arcuate-ascending to the margin, sometimes loop-connecting (especially in the upper ½ to ⅓ of the blade), raised on both sides; interprimary veins very few, obscure when dried; tertiary veins sunken above, raised on both surfaces when dried; collective vein arising from about the middle to the upper ⅓ of blade, 3–15 mm from margin; antimarginal vein arising from the base and continuous with margin. *Inflorescences* ± erect, equal to, shorter than, or longer than leaves; peduncle (18)30–90 cm long, 2–15 mm diam., 1.5–9(12)× as long as petiole, green, ± terete or slightly flattened on one side; spathe spreading-reflexed to reflexed, subcoriaceous, pale green, often with purple nerves or suffused violet-brown, linear-lanceolate to lanceolate, 5–16 cm long, 0.5–2.5 cm wide, broadest near the base, narrowly acute to acuminate at apex (acumen 10 mm long), decurrent at base; stipe 4–23 mm long in front, 3–20 mm long in back; spadix dark purple to reddish at anthesis, grayish green to brown post-anthesis, mostly cylindroid, slightly tapered at apex, erect, (3)5–15(17) cm long, 1–4(6) mm diam. near apex, 3–9 mm diam. near base; flowers rhombic to 4-lobed, (1.8)2.2–2.8 mm long, (1.6)1.8–2.4 mm wide, the sides ± straight or somewhat jaggedly sigmoid, 3–7(8) flowers visible in principal spiral, 5–7 in alternate spiral; tepals pale-punctate, smooth to minutely papillate; lateral tepals 1.2–1.8 mm wide, the inner margins rounded, the outer margins ± straight, 2-sided; pistils emergent, somewhat papillate; stigma squarish to rounded, 1.2 mm long, depressed medially; lateral stamens preceding the alternates by 6–20 spirals; anthers yellowish white, 0.6–0.8 mm long, 0.7–1 mm wide, inclined over and obscuring the pistil; thecae oblong to somewhat triangular, slightly divaricate. *Infructescence* with spathe withered or absent; spadix (5)8–25(35) cm long, 1–2 cm diam., bearing berries in the basal portion only, stipe 5–15 cm long; berries purple, white at base, obovoid, obtuse-truncate at apex, 5–7 mm long, 5–6 mm diam.; pericarp very thickened, with raphide cells; seeds 1–2 per berry, 4–5 mm long, 2–4 mm diam., with mucilage on one end but hanging on to carpel wall by thick band of fibers.

Anthurium bonplandii is known from sea level to 1,400 m throughout much of the northern Amazon basin, ranging from southeastern Colombia to southern Venezuela and to northern Brazil. It occurs on sandstone rocks of the Guiana shield as well as on granite boulders or granitic outcrops (materials originally underlying the Guiana shield) and on white sand deposited by eroded Guiana sandstone on the lowland plateau of the Tertiary Amazon Lakebed (Guerra, 1959).

This species is recognized by its distinctly long-pedunculate inflorescence (the peduncle typically being 1.5–7× as long as the petioles), by the glandular punctations on the underside of the leaf blade, by the tough, leathery pericarp and meager mesocarp in rehydrated berries, and by the seeds attached to the apical end of the inner carpel wall by a thick strand of fibers running midway from the apex to the base of the fruit.

Anthurium bonplandii may be confused with *A. atropurpureum*, which has leaf blades of similar shape and which also occurs on white sand deposits. The latter differs in having generally smaller, eglandular leaf blades which dry greenish (vs. brownish in *A. bonplandii*), as well as a smaller inflorescence and different berries. The berries of *A. atropurpureum* typically have a soft, pulpy mesocarp on rehydration and lack a fibrous attachment to the carpel wall, having instead a mucilaginous appendage, the typical condition for the section. *Anthurium bonplandii* is also similar to *A. guanchezii*, *A. iramirezae*, *A. lanjouwii*, and *A. xanthoneurum*. See those species for a discussion of the differences.

Anthurium bonplandii is variable in its overall morphology, as well as in ecological preferences. There are three subspecies:

Subspecies *cuatrecasii* ranges across the northern fringe of the Amazon basin from southeastern Colombia to the western half of Amazonas in Venezuela at 75–380 m, primarily on rocks. It differs from the other subspecies in its typically rounded or subtruncated leaf bases, longer peduncles and elongated stipe.

Subspecies *guayanum* occurs in the Guiana Highlands of Venezuela, Guyana, and Surinam, usually above 500 m, and differs from the other subspecies in its generally much larger, prominently dark, glandular-punctate (abaxially) leaf blades.

Anthurium bonplandii subsp. *bonplandii* ranges from southeastern Colombia (Vaupés, Meta, Guainia, and Amazonas) east to Venezuela and Brazil in the middle and upper Río Orinoco Basin, the upper Río Negro, and the Rio Trombetas, and south to the states of Amazonas, Pará, and Roraima in Brazil at usually less than 500 m (rarely to 825 m). It is predominantly terrestrial in sandy areas or, less frequently, is found growing on rocks or in open savanna areas, or in primary forest. In

Brazil, it has been reported from "caatinga" forest or "campina abierta." In Venezuela it occurs mostly in a tropical moist forest life zone. Subspecies *bonplandii* is recognized by its elliptic or rarely oblanceolate leaf blades which are acute at the base, and by its raised, caviform stigma. It is highly variable in size, leaf shape, and in the degree and type of glandlike structures on the lower blade surface. It overlaps geographically with the other two subspecies; see the discussions under the latter for further comments.

Particularly noteworthy in subsp. *bonplandii* are a series of collections from southwestern Venezuela in Amazonas along the upper Río Orinoco Basin and the intervening river system connecting the Río Orinoco with the Río Negro, e.g., the Río Casiquiare (including the Río Yatua, one of its tributaries). These collections are notable for their large size, with blades ranging from 63 to 98 cm long and 30 to 48 cm wide. Despite the fact that these collections differ rather radically from most others, they differ little from the largest plants found in populations around nearby San Carlos de Río Negro, where a wealth of collections from a small area enables a more clear assessment of interpopulational variation. Of these, the largest leaf blades observed were those of *Liesner 3778*, which are 85 cm long and 32 cm wide, with 10 primary lateral veins per side. The smallest plants from this area have blades 28 × 11 cm and only 8 pairs of primary lateral veins per side. These smaller plants differ little from collections made along the Upper Rio Negro in Brazil.

At the western edge of its range, the leaf blades of many collections of subsp. *bonplandii* are typically more narrowly oblong-oblanceolate than elsewhere, being up to 5× longer than broad. On average, blades are 2.6× longer than broad and infrequently are more than 3× longer than broad. The blades of most collections from the upper Rio Negro are 2.5–4× longer than broad, while collections from the middle Rio Negro and the upper Río Orinoco drainage range from 1.7 to 3× longer than broad.

The proportional length of the blade vs. the petiole is highly variable, ranging from only slightly longer to 14.4× longer. Blade shape appears to be in no way correlated with blade size, though the generally more narrowly oblanceolate blades of populations in eastern Colombia (Vaupés) have a more narrow range of variation, with blades 1.2–4.7× longer than broad and averaging 2.8× longer than the petioles. Populations in the northern extreme of the range in Amazonas in Venezuela have blades ranging from 1.1 to 8.3× (averaging 3×) longer than the petioles, while those in the middle of the range (upper Rio Negro in Brazil) are less variable, with blades ranging from 2.1 to 6.7× (averaging 4×) longer than the petioles. Populations from northwestern Pará in Brazil have proportionately shorter petioles, with blades ranging from 4 to 14× (averaging 7.9×) longer than the petioles.

An unpublished name, *A. disparile* Schott, represented by Schott Drawing 315 (New York Botanical Garden negative #3951 and microfiche 25: C3) based on a collection made by Linden on the Río Orinoco is *A. bonplandii* Bunting subsp. *bonplandii*.

BRAZIL. AMAZONAS: Cachoeira Republica, Rio Curuquete, *Prance et al. 14596* (NY); Camanaus–Uaupes, *Prance et al. 15690* (F, INPA, K, MG, NY, U, US); San Gabriel da Cachoeira, Morro dos Seis Lagos, Lago do Dragão, 400–450 m, *Farney et al. 1714* (MO); Igarapé do Buião, Manaus, *Rodrigues & Chagas 2010* (INPA); Manaus–Caracarai, km 26, *Prance et al. 3073* (INPA, NY, US); Manaus–Porto Velho, trecho Castanho–Tupana, *Silva et al. 200* (INPA); Manaus–São Gabriel, 00°35'S, 64°40'W, *Alencar 252* (NY); 53 km W of Rio Aripuana, Transamazon Hwy., *Calderon et al. 2705* (INPA, MO, US); Santa Isabel do Rio Negro, Campina de Tamendaui, *Madison et al. PFE 39* (INPA), *241* (INPA); 0°23'S, 65°2'W, *Maas 6679* (F, MO); km 795–790 Transamazonica Hwy., Rodovia do Estanho, 7°35'S, 62°30'W, *Vieira et al. 187* (INPA, MG, MO, NY); Pico Rondon, vic. Km 211 of Perimetral N Hwy., 700 m, 1°32'N, 62°48'W, *Pipoly et al. 6658* (MO, NY), *Prance et al. 28768* (INPA, MO, NY), *28785* (MO, INPA, NY); Reserva Biológica do INPA, Manaus, BR-174, Km 45, 500 m, *Anderson 318, 342* (INPA); Mpo. Manaus, Manaus–Caracarai, Campina Preserve, Km 45, less than 100 m, 1°40'S, 60°05'W, *Croat 62207* (INPA, MO); Reserva Florestal Ducke, Manaus, *Ferreira 5877* (INPA); Rio Brancinho, Rio Cuieras, *Prance et al. 17809, 17858* (INPA, NY); Rio Negro, *Maia et al. 689* (INPA); Barcelos–Tapurucuará, *Nascimento 627* (MG, NY); Iauarete, *Coelho & Francisco 203* (INPA); Ilha das Flores, 50 m, *Cavalcante 655* (GM); *Rodrigues 905* (RB), *906* (MO); Manaus–São Gabriel, Morro dos Seis Lagos, 80 km N of São Gabriel, 100 m, 0°20'N, 66°45'W, *Poole 2055* (INPA, MG, MO, NY); Serra de Uaupes, *Rodrigues & Coelho 1466* (MO), *Rodrigues 10718* (NY); Tamendaui, ca. 40 km below Tapurucuará, *Madison et al. 6241* (MO, SEL), *Maia et al. 252* (INPA); Tapurucuará–Mirím, Rio Marie, *Nascimento 656* (MG, MO, NY); *Projecto Flora Epifita 311* (MO); Rio Uaupes, Jutica, *Luetzelburg 23787* (M, R); Taracua, *Cavalcante 747* (GM); Rio dos Pombos, 9 km W of river, ca. 1.5 km E of Igarape dos Pombos, ca. 64 km E of the Aripuanã, 7°10'S, 60°00'W, *Calderon et al. 2606* (INPA); Serra Araca, 0°48'N, 63°18'W, *Pipoly et al. 6782* (NY); Central Massif, 700 m, 0°50'N, 63°17'W, *Prance et al. 29620* (MO, NY); Mpo. Barcelos, Rio Araca, Jauari, afluente de granito, 00°25'N, 63°25'W, *Cordeiro 242* (MO, NY); Mpo. Manaus, Rio Negro, NW of Manaus, *Madison et al. 6311* (K, SEL, US), *6393* (SEL), *Projecto Flora Epifita 39* (INPA). PARA: Cerro de Cupaty, Caqueta, *Lucke 12298* (GM); Rio Jaramacaru, Óbidos, *Egler 282* (MG, RB); Rio

Negro, *Cavalcante 3125* (MG, NY); Mpo. Altamira, Igarapé Ipixuna, affluent of Rio Xingu, 5 km S of settlement, Arawete Indian Reserve, 4°49'S, 52°31'W, *Balee & Ribeiro 1901* (NY); Mpo. Oriximina, Rio Mapuera, 30 km from Cachoeira Porteira, *Cid et al. 1208* (INPA, NY); ca. 10 km upriver from Cachoeira Porteira, *Davidson & Martinelli 10603* (INPA, MG, MO, US, NY); Rio Parú, Cachoeira Chuvisco, *Cid et al. 2228* (INPA, MG, NY); Rio Trombetas, 4 km from margin of Lake Maecue, *Cid et al. 1499* (INPA, NY); 7 km below Cachoeria Porteira, *Cid et al. 1298* (INPA, MG, MO, NY, US); Mpo. Tucuruí, Represa Tucuruí–Breu Branco, BR 422, Km 25, 90 m, 3°52'S, 49°44'W, *Plowman et al. 9564* (MG, MO, NY); Tucuruí, 100–200 m, *Lisboa et al. 2307* (MG). RORAIMA: Manaus–Caracari, Km 515, along bank of Igarapé Dias, *Steward et al. 131* (NY, INPA); Rio Uraricoera, Canal Maraca, Cachoeira Menori, 61°55'W, *Pires et al. 16792* (INPA, MG); Mpo. São Luiz do Anauá, *Ferreira 9233* (MO). COLOMBIA. AMAZONAS: Río Apaporis, Cachivera de Jirijirimo, 250 m, *Schultes 12094* (COL, GH), *Schultes & Cabrera 14083* (GH, NY, U); Río Caquetá, Caño Solarte, *Palacios et al. 1866* (U); Depto. Vichada, Río Mataveni (confluente of Río Orinoco), 100–140 m, *Bunting et al. 3623* (NY). AMAZONAS–VAUPÉS: Río Apaporis, Jirijirimo, 250–300 m, *Garcia-Barriga 13751* (COL, NY, US), *Schultes & Cabrera 12370* (AMES), *12436* (COL, GH), *13466, 13517* (GH), *13501, 15952* (AMES), *14641* (AMES, GH), *14051* (GH, U), *14571* (COL, US); Jinogoje, at mouth of Río Piraparana, ca. 350 m, 0°15'S, 70°30'W, *Schultes & Cabrera 17891* (GH). GUAINÍA: Río Negro, junction of Río Negro, Brazo Casiquiare and Río Guainía, 65 m, 2°00'14"N, 67°07'W, *Davidse & Miller 26577* (MBM, MO, VEN); across river from San Fernando de Atabapo (Venezuela), 120 m, 1°47'N, 67°06'W, *Gentry & Stein 46412* (B, K, MO, VEN), *46413* (MO). META: Llanos Orientales, La Macarena, Río Guayabero, Sabanas de Arenisca, 235–700 m, *Garcia-Barriga 17031* (COL, GH, NY, US). VAUPÉS: Cerro de Circasia 300–400 m, *Cuatrecasas 7178* (COL); Río Guainia, Puerto Colombia, opposite Venezuelan town of Maroa, 250–300 m, 2°40'N, 67°30'W, *Schultes & Cabrera 18242* (AMES); Río Kananari, Cerro Isibukuri, 0°15'N, 70°35'W, *Schultes & Cabrera 15082* (GH); affluent of Río Apaporis, *Schultes & Cabrera 13422* (GH); Río Kuduyari, trib. of Río Vaupes, 200–300 m, 1°15'N, 70°05'W, *Schultes & Cabrera 17877* (GH, MO, U); Río Kuduyari, Sabana Yapobada, 350–400 m, *Schultes 22677* (ECON); Río Negro, San Felipe, below confluence of Ríos Guainía and Casiquiare, *Schultes & Lopez 9330* (GH, NY, US); Río Parana–Pichuna, Mitú, *Zarucchi 1348* (COL, MO); Río Piraparana, tributary of Río Apaporis, *Schultes & Cabrera 17475, 17523* (GH); Río Vaupes, Mitú–Javarete, *Schultes & Cabrera 19266* (AMES); Cerro de Tipiaca, *Schultes & Cabrera 19307* (AMES, GH, U); Circasia, Mitú, *Zarucchi 2047* (COL, K, MO, US). VENEZUELA. AMAZONAS: 200 m, 5°05'N, 65°35'W, *Colchester 2043* (K); Cerro Moriche, Ríos Manapiare and Ventuari, 150–250 m, *Maguire & Maguire 35533* (NY, VEN); Cerro Neblina Region, Cerro Neblina, Río Mawarinuma, 140 m, 0°50'N, 66°10'W, *Croat 59326* (MO, RSA), *59388* (CM, MO), *59627* (B, K, MO, RSA, TEX); Loma de las Piñas (Pineapple Ridge), 1.5 km S of Neblina Base Camp, 150–215 m, 0°49'15"N, 66°9'40"W, *Nee 30554* (MO, NY, VEN); Río Mawarinuma, Cañón Grande, 350 m, 0°50'N, 66°02–06'W, *Davidse & Miller 27132* (VEN), *27174* (MO); 0.5–1.5 km SE of Cerro Neblina, 140 m, 0°50'N, 66°10'W, *Liesner 16147* (MO); Río Baría, 80 m, 1°27'–1°10'N, 66°32'–66°25'W, *Davidse 27683* (VEN); mouth of Río Pasimoni–junction with Río Baría and Río Yatua, 80 m, 1°53–27'N, 66°35–33'W, *Davidse 27780* (MO); Cerro Yapacana, 125–400 m, 3°45'N, 66°45'W, *Steyermark & Bunting 86762, 103060* (VEN); 825 m, *Steyermark & Bunting 103169* (VEN); Cerros del Casiquiare, 120 m, *Vareschi 6626* (VEN); Río Negro, Piedra de Cocui, *Schultes & López 9423* (GH, US); slope of Cerro Aracamuni, 600 m, *Liesner & Carnevali 22311* (MO); Río Orinoco, Gran Laja near Nericagua, *Morillo 7451* (VEN); 5 km above junction with Caño Cotua, SE of Cerro Yapacana, 100 m, 3°45'N, 66°50'W, *Steyermark & Bunting 102991* (MO, VEN); Cerro Yapacana, 3°45'N, 66°50'W, 140 m, *Sytsma et al. 5103* (WIS); Río Paragua, vic. "Minas de Manaima," 6°7'N, 63°45'W, *Stergios 10289* (MO, PORT); 6°22'N, 66°22'W, *Stergios 10129* (MO, PORT); Caño Cupaven, opposite mouth of Río Atabapo, 125 m, *Wurdack & Adderley 42828* (NY, US, VEN); Sanariapo–point 3 hr upriver by 33 h.p. motor, *Bunting 4255* (MO, MY); Dpt. Casigquiare, Río Temi, Yavita–Pimichín, 5 km from Pimichín, 125–140 m, *Bunting et al. 3774, 3867* (MY); Yavita–Maroa, 125–140 m, *Bunting et al. 3976* (NY); Río Yatua, base of Cerro Arauicaua, 125 m, 1°35'N, 66°10'W, *Steyermark & Bunting 102532* (MY, VEN), *102543* (VEN); Piedra Arauicaua, 110–550 m, *Maguire et al. 41601* (NY); San Carlos de Río Negro Region, 3–4 km N of San Carlos de Río Negro toward Solano, *Plowman 13536* (MO); Km 11 NE of San Carlos de Río Negro on road to Solano, 75 m, 1°53'N, 67°02'W, *Davidse & Miller 26556* (MO, VEN, W), *26559* (VEN); 115 m, *Berry 1366* (MO, VEN); *Stergios & Aymard 7742* (PORT); near airport, *Croat 59258* (AAU, MO, NY, US), *59260* (B, CAS, F, M, MO, NY); *Steyermark & Bunting 102741* (MO, VEN); 2–6 km NE of San Carlos de Río Negro, 120 m, 1°56'N, 67°03'W, *Liesner 3778, 6309* (MO), *6137* (VEN), *3277* (MO, SEL), *6402, 6568, 6569* (MO, VEN), *Morillo & Hasegawa 5093* (VEN); San Carlos–Solano, 2 km N of San Carlos, 100 m, *Morillo & Villa 5360* (VEN); Dpt. Atabapo, W base of Cerro Yapacana–Caño Cotua headwaters, 100 m, 3°38'N, 66°52'W, *Davidse et al. 17270* (VEN); Caño Caname, Curital de Caname, 100 m, 3°40'N, 67°22'W, *Davidse et al. 16966* (VEN); Dpt. Atures, Isla de Ratón, Carmen, 5°08'N, 67°54'W, *Carnevali et al. 1527* (MO); Río Orinoco, La Esmeralda, *Croizat 208* (NY); Siquita, 100–140 m, *Bunting et al. 3676* (MY); Puerto Ayacucho–Sanariapo, *Bunting 4279* (NY); Sanariapo–San Pedro, *Bunting 4239* (NY), Serranía de Yutaje, 0–1.5 km E of Río Coro–Coro, 4 km N of settlement of Yutaje, 270 m, 5°40'N, 66°7'30"W, *Liesner & Holst 21263* (MO); 3 km W of Río Coro–Coro, 5–8 km NW of settlement of Yutaje, 700–1,000 m, 5°40'N, 66°9'W, *Liesner & Holst 21816* (AAU, B, MO). APURE: Piedra de San Vincente, 80–160 m, *Davidse & Gonzalez 14537* (MO, NY, US, VEN); Dtto. Pedro Camejo, NW of Paso de Cinaruco, 60–65 m, *Davidse & Gonzalez 12467, 12612* (MO, VEN); Río Meta–Río Cinaruco, Caño El Caballo, 75 m, *Davidse & Gonzalez 15887* (MO, VEN), *13945* (MO, VEN); at jct. of Caño Siriaco, 70 m, *Davidse & Gonzalez 14147* (MO, VEN); Dtto. San Fernando, 60 m, *Davidse & Gonzalez 13895* (F, MO VEN). BOLÍVAR: Mpo. Raul Leoni, 64 km SE of Pijiguaos, 550 m, 06°09'N, 66°23'W, *Delgado 298* (MO).

b. **Anthurium bonplandii** subsp. **cuatrecasii** Croat, Aroideana 9(1–4): 11–14. 1986. TYPE: Venezuela. Amazonas: Dept. Atabapo, vic. Puerto Ayacucho, along rd. from Puerto Ayacucho to Sanariapo, *Croat 55065* (holotype, MO 2934844; isotypes, B, DUKE, GH, NY, RSA, US, VEN). Figures 56–58.

Terrestrial or epilithic, occasionally epiphytic; stem often caespitose, 1–4 cm diam.; roots dense, mostly descending, the uppermost ascending, grayish when dried, slender and elongate, to 25 cm long, 2–5 mm diam.; cataphylls coriaceous, 4–14 cm long, acute to weakly acuminate at apex, persisting ± intact, eventually dilacerating into fibers at base. *Leaves* erect; petioles 4–30(40) cm long, drying 3–11 mm diam., C-shaped or nearly D-shaped, broadly and sharply sulcate to nearly flattened, with the margins prominently raised adaxially, rounded abaxially; geniculum 0.5–2 cm long; blades coriaceous, oblanceolate, often ± elliptic to slightly ovate-elliptic, rarely oblong-elliptic, acute to weakly acuminate at apex, narrowly rounded to truncate at base, sometimes obtuse, (16)25–55(70) cm long, 4–25(32) cm wide, broadest at or above the middle, the margins weakly undulate; upper surface semiglossy to glossy, medium to dark green above, the lower surface semiglossy, paler, pustulate or glandular-punctate below; midrib scarcely raised at base above, becoming convexly raised toward the middle, prominently convexly raised below; primary lateral veins 5–10 per side, departing midrib at (30)40–55(75)° angle, usually weakly arcuate-ascending to the margin, loop-connecting in the upper ⅓ of the blade, convexly raised; interprimary veins occasionally present; tertiary veins weakly etched above, slightly raised or flat and darker than surface below, prominulous when dried; collective vein arising from near the apex, less prominent than primary lateral veins, often absent, 2–10 mm from margin. *Inflorescences* erect; peduncle (19)30–100 cm long, drying 5–10 mm diam., 1.3–7 × as long as petiole, terete; spathe reflexed, usually twisted or recurled, membranous-chartaceous to subcoriaceous, pale yellowish green, sometimes suffused with reddish purple, linear-lanceolate, 5–20 cm long, 0.5–2.5 cm wide, broadest near the base, acuminate at apex (the acumen ca. 5 mm long), decurrent at base; stipe 15–40 mm long; spadix pale green, becoming pink to maroon at maturity, drying green, tapered, erect, (6)10–25 cm long, 5–15 mm diam. near base, 3–6 mm diam. near apex, broadest at the base; flowers rhombic to 4-lobed, drying 1.6–2.6(3.0) mm long, (1.2)1.5–2.6 mm wide, the sides smoothly sigmoid, (4)5–8 flowers visible in either spiral; tepals smooth to somewhat roughened, sometimes whitish muricate; lateral tepals 1.2–1.8 mm wide, the inner margins convex, the outer margins 2–3-sided; pistils ± square, barely or not at all emergent; stigma oblong, ± rectangular, 0.6 mm long, densely papillate; filaments exserted ca. 1 mm; anthers 0.4–1 mm long, 0.4–1.2 mm wide, contiguous, surrounding pistil; thecae drying ± ellipsoid, divaricate. *Infructescence* with spathe withered or absent; spadix (5)10–22 cm long, 0.8–2 cm diam., bearing berries in the basal portion only; berries (immature) green, obovoid, ± truncate at apex, 4–6 mm long, 3–5 mm diam.; pericarp thickened, with raphide cells; seeds 2 per berry, with raphides on the surface, broadly ellipsoid, 4–5 mm long, 1.8–3 mm thick, 1.2–1.4 mm diam., attached to apical end of carpel by strand of fibers.

Anthurium bonplandii subsp. *cuatrecasii* ranges from southern Colombia (Mitú in the Serranía de la Macarena) northeast to the drainage of the middle and upper Río Orinoco in Venezuela (Amazonas) at 75–380 m. Principally found on granite boulders, it often has a caespitose habit, growing in humus tufts either on granite outcrops or terrestrially on soils with a granitic base. It occurs in the tropical dry, tropical moist, and premontane wet forest life zones.

Subspecies *cuatrecasii* differs from the other two subspecies of *A. bonplandii* in having leaves which mostly dry green or greenish and are usually rounded to narrowly truncate at the base, and by its long-pedunculate inflorescence with a usually long-stipitate spadix.

The species is difficult to separate from subsp. *bonplandii* in regions of geographical overlap such as the Mitú area of Vaupés in eastern Colombia or the Middle Orinoco River Basin. *Schultes & Cabrera 19709*, from the Rio Vaupés area near Mitú in Colombia, with both long- and short-stipitate spadices, exemplifies such taxonomic difficulty. It is possible that this collection, and others within this range of sympatry, are the result of local hybridization involving subsp. *bonplandii*.

COLOMBIA. GUIANÍA: Río Orinoco, S of Casuarito, Lejas, 90 m, 5°40′N, 67°37′W, *Davidse & Miller 26370* (**MO**); across river from San Fernando de Atabapo (Venezuela), 120 m, 1°47′N, 67°06′W, *Gentry & Stein 46412* (**B, K, MO**, VEN). META: Mun. El Refugio, Parque Nacional Sierra de la Macarena, 10 km E of Refugio, 410 m, *Callejas & Arias 6475* (HUA, **MO**); Río Guayabero, 10 km below Caño Lozada, 500 m, *Pinto & Jaramillo 208*

(COL); 250 m, *Echerverria 2054* (COL). VAUPÉS: Cerro Mitú, 380 m, *Cuatrecasas 6885* (COL, US), *Schultes et al. 24202* (AMES), *Schultes 22702* (GH); Cerro Mitú–Río Vaupés, 200 m, *Soejarto & Lockwood 2495* (F, K, MEDEL); 350 m, *Maguire et al. 44103* (NY, US); Río Vaupés, Mitú, 250 m, *Schultes & Cabrera 13912* (GH, U); Mitú–Javarete, Arara Cachwira, *Schultes & Cabrera 19397* (GH); Raudal de Yurupari, near Mitú, 0°40′N, 70°30′W, *Schultes & Cabrera 19709* (AMES, GH, MO, NY, U); Mitú, *Zarucchi 1676* (COL, K, MO, US); 350 km above Mitú, Yurupari, 220 m, *Cuatrecasas 6963* (COL, US); Río Inirida, Raudal Guacamayo, 180 m, 69°45′W, *Fernández 2156* (COL, F, US); Río Karuru (tributary of Río Vaupés), Mesa de Yambí, 300–350 m, *Schultes & Cabrera 19147* (AMES), *19194* (AMES, GH, U); Río Kuduyari (tributary of Río Vaupés), Yapoboda, 230–270 m, 1°15′N, 70°05′W, *Schultes & Cabrera 14257* (GH), *14273* (GH, U), *Schultes et al. 18456* (AMES), *Garcia-Barriga et al. 15823A*, *15823* (COL, GH). VICHADA: Parque Nacional Natural "El Tuparro," Río Orinoco at mouth at Río Tuparro, 100 m, 5°15′N, 67°51′W, *Zarucchi & Barbosa 3416* (MO). VENEZUELA. AMAZONAS: *Bogner 960* (M); Caño Mosquito, Caño Marieta, *Lister 266* (K); Puerto Ayacucho Region, vic. Puerto Ayacucho, *Huber 612* (M, MO, VEN), *Plowman 7742* (F, K, MO, SEL), *Wessels Boer 1904* (MO, U), *Williams 18379* (VEN); Puerto Ayacucho–Sanariapo, Río Cataniapo, near airport, 100 m, *Croat 55065* (B, MO, NY), *Gentry & Berry 14438* (MO), *Trujillo & Pulido 14958* (MY), *Williams 16037* (F); 3 km N of Puerto Ayacucho, 140–180 m, *Morillo 6753* (MY, VEN); 8 km S of Puerto Ayacucho, Estación de Piscicultura, 85 m, 5°36′N, 67°37′W, *Davidse & Huber 14894* (MO), *Davidse & Miller 26343* (MO); 20 km S of Puerto Ayacucho, N of Caño Garcitas, 100–130 m, 5°33′N, 67°33′W, *Carnevali & Guánchez 1493* (MO); 23 km NE of Puerto Ayacucho, road to El Burro, 80–150 m, 5°51′N, 67°29′W, *Davidse & Huber 15282* (MO, VEN); Isla de El Ratón, 100 m, *Williams 13446* (US, VEN); Río Cataniapo, 80 m from bridge to Sanariapo, 6°25′N, 67°25′W, *Castillo 1237* (MO); Río Guayapo, 10–15 km above mouth of Río Guayapo, tributary to Río Sipapo, 160 m, *Morillo & Ishikawa 3432* (VEN); Río Orinoco, middle and upper parts, *Pannier-Schwabe 1160* (VEN); Santa Rosa–mouth of Río Vichada, Laja Picure, just below Raudal Picure, 100 m, *Maguire et al. 36194* (NY, VEN), *36197* (NY, US, VEN); La Esmeralda, *Medina 349* (VEN); Dpt. Atabapo, Caño Cotua, Yapacana, *Huber 1778* (VEN); Cerro Yureba, Salto Yureba, lower Ventuari, 350 m, 4°03′N, 66°01′W, *Liesner 18654B* (MO); Río Ventuari, 20 km E of Río Orinoco junction, 98 m, 4°03′N, 66°49′W, *Huber 1853* (VEN). BOLÍVAR: mouth of the Paraguaza, Laja del Zamuro, 150 m, *Trujillo 10756* (MY); vic. Minas de Manaima, middle Río Paragua, 6°7′N, 63°45′W, 300 m, *Stergios 10291* (PORT); Río Orinoco, rocky outcrops on Isla Sta. Elena, 100–150 m, *Wurdack & Monachino 39874* (F, NY, US, VEN); Río Paragua, *Badillo 1451* (VEN); Dtto. Cedeño, 35 km SW of Caicara del Orinoco, 100–300 m, 7°30′N, 66°20′W, *Steyermark et al. 131274* (MO).

c. **Anthurium bonplandii** subsp. **guayanum** (Bunting) Croat, comb. nov. *Anthurium guayanum* Bunting, Acta Bot. Venez. 10: 268. 1975. TYPE: Venezuela. Bolívar: Chimantá Massif, NW part of Abacapa Tepuí, 850–1,100 m, *Steyermark 75100* (holotype, VEN 2005409; isotypes, F, MO, NY). Figures 60–62.

Anthurium corocoroense Bunting, Phytologia 64: 462. 1988. TYPE: Venezuela. Amazonas: Dpt. Atures, Cerro Yutaje, northwest ridge, in montane woodland, 1,500 m, *Maguire & Maguire 35425* (holotype, NY).

Anthurium guaiquinimae Bunting, Phytologia 64: 462. 1988. TYPE: Venezuela. Bolívar: Dtto. Heres, summit of Cerro Guaiquinima, 1–2 km by river above Salto Szczerbani (Río Caparo), 5°44′04″N, 63°41′08″W, 750 m, *Steyermark et al. 113258* (holotype, MO 2581469; isotype, VEN).

Terrestrial or occasionally epiphytic; stem to ca. 20 cm long; internodes short, 1–7 cm diam.; roots dense, spreading, the uppermost ones ascending, thick and blunt at apex, 5–12 cm long, 1–5 mm diam.; cataphylls subcoriaceous or fleshy, 2.5–12 cm long, acute at apex, tinged with red, persisting as coarse linear fibers at base. *Leaves* erect to arching when large; petioles (3)6–30(42) cm long, 8–15 mm diam., C-shaped or sharply D-shaped, sulcate to flattened with the margins sometimes weakly raised and a broad medial rib occasionally present adaxially, rounded abaxially, sometimes 1–2-ribbed; geniculum slightly thicker than petiole, 0.5–1 cm long; blades coriaceous, oblanceolate to obovate, rarely broadly elliptic, acute to obtuse to rounded at apex, long-attenuate to acute or obtuse at base, 30–80(140) cm long, 20–40(65) cm wide, broadest above the middle, the margins undulate; upper surface semiglossy, dark green, lower surface semiglossy to matte, paler and with pustules and glandular-punctations; midrib flat to broadly sulcate at base, sometimes with faint medial rib, becoming prominently convex toward the apex above, higher than broad at base, becoming convexly raised toward apex below; primary lateral veins 6–9(13) per side, departing midib at 40–60° angle, ascending and weakly arcuate to the collective vein, loop-connecting in the upper ⅓, raised in grooves above, raised and paler than surface below; tertiary veins sunken above, raised below; collective vein arising in the upper ⅓ of blade, almost as prominent as primary lateral veins, or often absent, 5–10 mm from margin. *Inflorescences* erect-spreading, nearly as long as or longer than leaves; peduncle 24–96 cm long, 4–10 mm diam., (1.5)4–5(7)× as long as petiole, green tinged with maroon or purple, terete; spathe spreading-reflexed, sometimes inrolled, coiling-recurled or reflexed, subcoriaceous, pale to medium green, sometimes suffused with purple, oblong-lanceolate, (4)8–

18(24) cm long, 1–3.5 cm wide, broadest near the base, acute to shortly acuminate at apex (the acumen ca. 10 mm long), obtusely clasping at base; spadix greenish when young, becoming reddish to purple or purple-brown at anthesis, sessile or subsessile, ± cylindroid, shortly to gradually tapered at apex, erect, 5–33 cm long, ca. 5–7 mm diam. near base, 2–3 mm diam. near apex; flowers (dried) rhombic, (1.6)2.8–3.4 mm long, (1)1.8–2.8 mm wide, the sides straight parallel to spiral, smoothly and weakly sigmoid perpendicular to spiral; 3–7(9) flowers visible in principal spiral, 4–6 in alternate spiral; tepals minutely papillate, sometimes whitish muricate, matte; lateral tepals 1.4–2 mm wide, the outer margins 2-sided, the inner margins broadly convex; pistils squarish, weakly emergent; stigma rectangular, 0.6 mm long, appearing papillate; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by 7–10 spirals, the 3rd stamen preceding the 4th by 6–8 spirals, arranged in a circle, inclined over and obscuring the pistil; anthers yellow, 0.4–0.6 mm long, 0.5–0.8 mm wide; thecae oblong, 0.2–0.3 mm wide, slightly divaricate; pollen white. *Infructescence* with spathe withered, eventually deciduous; spadix 8–35 cm long, to 2 cm diam., bearing berries in the basal portion only, the apical portion sometimes weathering away; berries reddish purple, white in basal ⅓, obovoid, 6–10 mm long, 5–8 mm diam.; pericarp thickened, with raphide cells; seeds 1 or 2 per berry, reddish violet, ellipsoid, weakly flattened, 3–6 mm long, 2–5 mm diam., 1–2 mm thick, attached to carpel wall at radicle end and by a thick strand of fibers.

Anthurium bonplandii subsp. *guayanum* occurs in the Guiana Highlands of Venezuela, Brazil, Guyana, and Surinam, most material being from Bolívar State in Venezuela, at (100)400 to 1,500 m on sandstone outcrops, sandstone boulders or in pure white sand deposits in open areas and in partial shade. It is ecologically variable, occurring in premontane moist, premontane wet, premontane rainforest, and tropical wet forest life zones.

This subspecies is characterized by its usually large, often broad, coriaceous leaf blades which have unusually dark and conspicuous glandular punctations on the lower surface.

It is distinguished from subsp. *bonplandii* mainly by its oblanceolate to obovate (vs. mostly elliptic) leaf shape, and from subsp. *cuatrecasii* by the leaf blades being usually acute at base and drying brown (vs. greenish) and by the sessile to subsessile (vs. usually markedly stipitate) spadix. Both of these subspecies occur at lower elevations than subsp. *guayanum*, usually below 500 m.

The subspecies *guayanum* may be easily confused with the other two subspecies of *A. bonplandii* in areas where their ranges overlap, especially in the upper Río Orinoco drainage and along the rivers of southern Amazonas, Venezuela, that flow into Río Negro.

Two species described recently by Bunting (1988) are synonymized here. Both are compared with only *A. bonplandii*. *Anthurium corocoroense* differs in no way from typical *A. bonplandii* subsp. *guayanum*, and *A. guaiquinimae* differs only in a minor way. Characters which are stressed as important are the broad spathe (to 2.5 cm wide) and the abruptly rounded leaf base. The spathe of subsp. *guayanum* may range to 3.5 cm wide and the abruptly rounded leaf base is an occasional feature on some material of subsp. *guayanum* (see for example *Davidse & Miller 27174* from Cerro Neblina and *Geyskes 16* from Surinam).

BRAZIL. RORAIMA: Serra dos Surucucus, NE of Mission Station, 1,000–1,400 m, 2°42'N, 63°33'W, *Prance et al. 10010* (INPA, NY). GUYANA. MAZARUNI–POTARO REGION: upper Mazaruni River Basin, Karowrieng River, above Maipuri Falls, 550 m, 5°42'N, 60°03'W, *Pipoly & Alfred 7635* (US). SURINAM. Arrowhead basin, Tafelberg, 500 m, *Maguire 24458* (NY, US); Emma Mts., W slope, 600 m, *Boer 1481* (NY); Gonggrijp top, 950 m, *Daniels & Jonker 1286* (U); Gonggrijp top-Hendrik top, Stahel top, 700 m, *Daniels & Jonker 807* (NY). VENEZUELA. AMAZONAS: Dpt. Atures, Río Coro–Coro, W of Serranía de Yutaje, 8 km N of Yutaje, 650–750 m, 5°41'30"N, 66°07'30"W, *Holst & Liesner 3128* (MO); Río Manapiare, Serranía Yutaje, Caño Yutaje, 1,500 m, *Maguire & Maguire 35425* (NY, VEN); Río Orinoco, Esmeralda Ridge, 150–200 m, *Maguire & Wurdack 34642* (NY, VEN); Dpt. Atabapo, Cerro Huachamacari, 1,000 m, 3°39'N, 65°43'W, *Liesner 18228* (MO); Duida–Marahuaca, 1,000–1,200 m, 3°34'N, 65°32'N, *Liesner 25547* (F, DUKE, MO, US); Serranía del Parú (Aroko), 1,100 m, 4°31'N, 65°35'W, *Huber 4345* (VEN); Dpt. Río Negro, Cerro Neblina, N of Puerto Chimo, 500–700 m, 0°50'N, 66°06'W, *Davidse & Miller 27384* (MO); along Río Mawarinuma, Cañón Grande, 300 m, 0°50'N, 66°02–06'W, *Davidse & Miller 27245* (MO). BOLÍVAR: 0–6 km S of El Puaji, 800–900 m, 4°30'N, 61°35'W, *Liesner 19718, 19782* (MO), *Liesner & Holst 18799* (MO); Esmeralda Ridge, Esmeralda, 100 m, *Tate 189* (NY); Santa Elena–Icabarú, 106 km SW of Santa Elena, 13 km NE of Icabarú, Esmeralda, 750 m, 4°19'N, 61°46'W, *Croat 54062* (B, F, GH, MO, US); Canaima, 800 m, *Ferrari 1106* (MY), *Trujillo 6015* (MY), *Bunting 4346* (NY); Quebrada Los Brasileros-road to Playa Blanca and Río Uaiparú, SW of Icabarú, 450 m, 4°20'N, 61°48'W, *Steyermark et al. 117747* (MO, VEN); Cerro Bolívar, Piar, 750 m, *Aristeguieta 2275* (NY); Cerro Guaiquinima, 300 m, *Maguire 32743* (NY, VEN); Salto del Río Szczerbanari (Río Carapo), 1–2 km above Salto Szczerbanari, 750 m, 5°44'N, 63°41'W, *Steyermark &*

Dunsterville 113258 (F, MO, U, VEN), *Steyermark et al. 117258* (MO, VEN); Cerro Marajanu, Alto Caura, 550 m, *Cardona Puig 2959* (MO, VEN); Cerro Sarisarinama, Meseta de Jaua, 700 m, 4°41'N, 64°13'W, *Steyermark et al. 108992* (VEN); Chimantá Massif, Base Camp–slopes above valley of Río Tirica, SW-facing slopes of Chimantá-tepuí (Torono-tepuí), 1,000–1,400 m, *Steyermark 75378* (F, NY, VEN); NW part of Abacapa-tepuí, 850–1,100 m, *Steyermark 75100* (F, MO, NY); Auyán-tepuí, Guayaraca, 1,000 m, *Bogner 1534* (M, MO), *Steyermark 94210* (VEN); Dtto. Piar, Pie de la Roca–Guayaraca, Auyán-tepuí, 600–850 m, 5°43'N, 62°31'W, *Davidse & Huber 22658* (MO); lower part of Río Caroni, Sabana de Arekuna, 6°31'N, 62°53'W, *Prance & Huber 28334* (MO); Río Icabarú and Río Hacha, 450–850 m, *Bernardi 2827* (NY); Río Paragua, Salto de Auraima, 275 m, *Killip 37358* (US, VEN); Sierra Ichun, N of Salto María Espuma (Salto Ichun), near Río Ichun (tributary of Río Paragua), 625–725 m, 4°46'N, 63°18'W, *Steyermark 90240* (BH, US); Dtto. Roscio, 1 km N of Río Samay, 600–800 m, 4°25'N, 61°37'W, *Holst & Liesner 2479* (MO); 7 km NW of Icabarú, 400 m, 4°20'N, 61°51'W, *Steyermark et al. 127301* (B, MO); Mpo. Urucuru, Avequi, "Ciudad Muerte," 500 m, *Bernardi 1687* (NY); Mpo. Urucuru, Río Hueque, Cerro del Papelou, 700 m, *Bernardi 1641* (NY).

Anthurium bradeanum Croat & Grayum, sp. nov. TYPE: Panama. Coclé: Cerro Moreno, Molejón–Coclecito, 13 km NW of Cascajál, 130–250 m, *Davidse & Hamilton 23715* (holotype, MO 3039173; isotypes, B, K, RSA). Figures 63, 64.

Planta epiphytica; cataphyllum lanceolatum, acuminatum, persistens semi-intactum, demum fibris linearibus findens; lamina elliptica ad oblanceolato-elliptica vel ovato-elliptica, (20)25–60 cm longa, 8.5–21 cm lata; nervis primariis lateralis (5)10–15 utroque. Pedunculus 21–58 cm longus, angulatus; spatha ovata, deflexa, cucullata, viridis, 2.5–6(9) cm longa, 2.1–4 cm lata; spadix flavovirens, citreus vel cremeus, clavatus, 1.9–5 cm longus, 8–10 mm diam. Fructus luteus ad albus, ovoideus.

Epiphytic; stem very short, 0.5–1.5 cm diam.; roots moderately dense, descending, green, pubescent, moderately slender and elongate, tapered, 2–4 mm diam.; cataphylls subcoriaceous, lanceolate, 6–9 cm long, acuminate at apex, light green, drying tan (B & K red 9/10), persisting semi-intact, eventually as linear fibers. *Leaves* erect-spreading to spreading; petioles 6–32(40) cm long, 5–7 mm diam., ± quadrangular, occasionally D-shaped, flattened to rounded adaxially, the margins sharply raised but not winged, sharply 2–3-ribbed abaxially (sometimes rounded), the surface pale-speckled; geniculum paler and thicker than petiole, becoming fissured transversely with age, 0.8–2.5 cm long; blades subcoriaceous, elliptic to oblanceolate-elliptic to obovate-elliptic, less than 5× longer than wide, long-acuminate at apex (the acumen apiculate), acute to abruptly attenuate at base, (20)25–60 cm long, 8.5–21 cm wide, broadest at or above the middle, the margins weakly undulate, both surfaces glossy to semiglossy, medium green above, paler below, drying green, semiglossy to matte; midrib flat at base, becoming convexly raised toward the apex, pale-speckled, paler than surface above, sharply 2-ribbed and higher than broad at base, becoming convexly raised toward the apex, paler than surface below; primary lateral veins (5)10–15 per side, departing midrib at 30–40° angle, ± straight to the collective vein or weakly arcuate-ascending, moderately sunken, becoming weakly sunken toward the margin above, prominently and convexly raised below, paler than surface above and below; tertiary veins weakly visible above, slightly darker than surface below; collective vein arising from near the base or about the middle of the blade, sunken above, raised below, less prominent than primary lateral veins, 1–3 mm from margin. *Inflorescences* erect-spreading to spreading, usually shorter than leaves; peduncle 21–58 cm long, equaling or 2–3× longer than petioles, several-angled to subterete with prominent sharp rib abaxially, conspicuously pale-speckled; spathe boat-shaped, about as long as spadix and hooded over it (directed at ca. 180° angle to peduncle), coriaceous, dark green, somewhat discolored along margins, ovate, cucullate, 2.5–6(9) cm long, 2.1–4 cm wide, inserted at 50–70° angle on peduncle, abruptly to gradually acuminate at apex, rounded to truncate at base, decurrent on petiole; spadix deflexed, pale yellow-green to lemon-yellow to creamy-white, (occasionally brownish), sessile, clavate, 1.9–5 cm long, 8–10 mm diam., directed at ca. 90° angle from peduncle; flowers 4-lobed, 1.6–2.2 mm long, 2–2.5 mm wide, the sides jaggedly sigmoid; 16–20 flowers visible in principal spiral, 13–16 in alternate spiral; tepals matte, conspicuously papillate; lateral tepals 0.6–0.9 mm wide, the inner margins straight to convex and turned up against pistil; pistils emergent to 0.5 mm, white to pale greenish white; stigma 0.2 mm long, brushlike, droplets appearing 2–3 days before stamens emerge, persisting for 2 weeks; stamens emerging in a complete sequence, emerging well above tepals then retracting; lateral stamens soon followed by 3rd and 4th stamens, arranged in tight cluster above pistil; filaments whitish, exserted, 0.3–1 mm long, 0.2–0.3 mm wide; anthers pale yellow, 0.3–0.4 mm long, 0.5–0.6 mm wide; thecae ellipsoid; pollen pale yellow fading to white, sweet-scented. *Infructescence* spadix 5–11 cm long; berries greenish yellow to white (also reported as reddish), obovoid, sharply pointed at apex, 4–4.3 mm long, 2.5 mm diam.; seeds 2 per berry, yellowish brown, oblong-ovoid, flattened, 3.2–3.5 mm long, 1.5–1.9 mm diam., 1.1–1.2 mm thick.

Anthurium bradeanum ranges from Nicaragua to Panama in tropical wet forest life zones from near sea level to usually 450 m, rarely to 800 m.

This species is distinguished by its long, sharply margined petioles, its more or less elliptic leaf blades, its cucullate, coriaceous, ovate spathe, its deflexed, short, clavate, lemon-yellow to white spadix, and yellow to white fruits.

Anthurium bradeanum may be confused with *Anthurium spathiphyllum* where they occur together, such as at the La Selva Biological Station in Costa Rica. Both species have a short clavate spadix, but *A. spathiphyllum* differs in having narrower leaves with 20–30 prominently sunken primary lateral veins (vs. 5–15 scarcely sunken veins in *A. bradeanum*). In addition, *A. spathiphyllum* commonly has three-sided petioles and a lanceolate spathe that is about twice as long as the spadix. In *A. bradeanum*, the spathe is ovate and as long as the spadix.

The species is named in honor of Alexander Curt Brade, who made the first collection of the species in Costa Rica during 1908–1910. The species was not recollected until 1970, when I collected it in Panama at Guásimo in Colón Province.

The species was mistakenly called *A. cuneatissimum* (Engl.) Croat in the revision of *Anthurium* for Central America (Croat, 1983, 1986). That name is now considered synonymous with *A. consobrinum* Schott.

COSTA RICA. ALAJUELA: 15 km WNW of Quesada by air, 1 km W of Jaillos, 150–200 m, 10°23′N, 84°33′W, *Liesner et al. 15175* (MO); 22 km NE of Quesada by air, 4 km W of Muelle San Carlos, 10°28′N, 84°30′W, *Liesner 14112* (CR, K, MO); San Carlos, vic. Florencia, 250 m, *Haber et al. 1854* (MO); between San Miguel and El Pilón, 600 m, 10°43′30″N, 85°00′30″W, *Herrera 2069* (CR, DUKE, MO); Llanuras de San Carlos, *Brade 2539* (BR); Cañas–Upala Road, Río Zapote, 3–4 km NNE of Bijagua 400–450 m, *Burger & Baker 9820* (MO), *Croat 36275, 36296* (MO); 13.8 km N of Bijagua, 100–150 m, *Croat 36454* (B, C, DUKE, F, K, M, MBM, MO, P, QCA, S, U, US); NNE of Bijagua, 200 m, *Croat 36480A* (MO); Río Peje; Ciudad Quesada–Florencia, 1 km E of Florencia, 250 m, 10°21′N, 84°28′W, *Hammel et al. 14032* (MO, US); Monteverde Reserve, Peñas Blancas river valley, 800 m, 10°20′N, 84°40′W, *Haber et al. 5116* (MO). HEREDIA: Puerto Viejo Region, Río Sucio, 20 m, *Croat 35751* (CAS, MO); San José–Puerto Viejo, vic. of Chilamante, 11.6 mi. N of Cariblanco, 10°27′N, 84°05′W, 100 m, *Croat 68361* (MO); Finca La Selva, *Christenson 1532* (MO). LIMÓN: between Barra del Colorado and ocean beach, 0–2 m, 10°47′N, 83°35′W, *Stevens 24092* (MO); 3.5 km S of Islas Buena Vista in the Río Colorado, 16 km SW of Barra del Colorado, 10–120 m, 10°39′N, 83°40′40″W, *Davidse & Herrera 31243* (K, MO); Cerro Coronel, E of Río Zapote, 10–40 m, 10°40′N, 83°40′W, *Stevens et al. 24723* (MO); Reserva Biológica Hitoy Cerere, Río Cerere–Quebrada Barrera, SW of Valle La Estrella, 550 m, 9°39′N, 83°02′W, *Grayum et al. 5810* (MO); 100–250 m, *Gómez et al. 23663* (CR, MO); Río Colorado, 2 km upstream from downstream branch of Caño Bravo, 5 m, 10°43′N, 83°40′W, *Stevens 24018* (MO). NICARAGUA. ZELAYA: 1 km N of Barra de Punta Gorda, 10 m, 11°31′N, 83°46′W, *Moreno 13274* (MO); Río Punta Gorda, Atlanta, landing field, 10 m, 11°34′N, 84°1′W, *Moreno & Sandino 12768* (MO); Atlanta, SE of "La Richard," 30 m, 11°32′N, 84°5′W, *Moreno & Sandino 13117* (MO); Monkey Point, 1.5 km from Caño El Pato, 10 m, 11°35′N, 83°42′W, *Moreno 12373, 12422* (MO); Caño Monte Cristo, Las Faldas, 40–60 m, 11°36′N, 83°51′W, *Moreno 14810* (MO); Río Serrano, 1 km of Colonia Serrano, 70–80 m, 11°34′N, 84°21–22′W, *Sandino 3446* (MO). PANAMA. COCLÉ: Cerro Moreno, Molejón–Coclecito, 13 km NW of Cascajal, 130–250 m, 8°46′44″N, 80°31′54″W, *Davidse & Hamilton 23715* (B, K, MO, RSA); El Copé Region, N of El Copé, Limón, *Folsom 5815* (MO, PMA). COLÓN: Río Miguel, Guásimo, *Croat 9902* (MO, PMA, SEL).

Anthurium brenesii Croat & R. A. Baker, Brenesia 16(Suppl. 1): 28. 1979. TYPE: Costa Rica. Alajuela: along Hwy. 15 between Naranjo and Quesada, 3.2 mi. N of Zapote, 1,560 m, *Croat 46923* (holotype, MO 2682420; isotypes, COL, CR, DUKE, F, GH, K, MEXU, NY, P, PMA, RSA, SEL, U, US, VEN). Figures 65, 67–69.

Epiphytic; stem usually pendent, less than 30 cm long, 1.5–2.5 cm diam.; roots sparse, descending, green to brown, pubescent, thick, elongate, slightly tapered, 5–7 mm diam.; cataphylls moderately coriaceous, weakly ribbed near apex, 10–25 cm long, acuminate at apex, drying light brown, persisting semi-intact, eventually as a reticulum of fibers. *Leaves* spreading to pendent; petioles 11.5–45 cm long, 3–6 mm diam., terete, rounded to obtusely and obscurely sulcate adaxially, the surface pale-speckled; geniculum somewhat thicker than petiole, 1.5 cm long; blades coriaceous, oblong-elliptic to oblong, acuminate at apex (the acumen minutely inrolled), acute to obtuse to narrowly rounded at base, 16–68 cm long, 4.3–10.3 cm wide, broadest at or near the middle, the margins weakly undulate; both surfaces matte to weakly glossy, dark green above, paler below, drying yellowish green; midrib bluntly angular-raised above, pale-spotted in lower half, prominently convexly raised, much paler than surface below; primary lateral veins 13–16 per side, scarcely more conspicuous than interprimary veins, departing midrib at 35–45° angle, broadly arcuate, weakly sunken above, weakly raised and darker than surface below; tertiary veins obscure above and below; collective vein arising from the base, slightly sunken above, raised and darker than surface below, equally as prominent as primary lateral veins, 2–5 mm from margin. *Inflorescences* shorter than leaves; peduncle (10)28–43 cm long, 4–5 mm diam., 2–3/4× as long as petiole, terete; spathe erect and somewhat hooded over the spadix, moderately coriaceous, medium green, sometimes tinged with red or violet-purple, ovate to ovate-elliptic, 5.5–8.5 cm long, 3.5–5.5 cm wide, broadest just above the base or near the middle, inserted at 25–40° angle on peduncle, acute to rounded at apex (the acumen apiculate), cordate and somewhat clasping at base; spadix green to red-brown to red-violet to purple, short-cylindroid, somewhat stubby, 3.2–8 cm long, 6–8 mm diam.; flowers ± square to weakly 4-lobed, 1.7–2.5 mm in both directions, 6–10 flowers visible in either spiral; lateral tepals 0.8–1.2 mm wide, the inner margins straight to broadly convex, the outer margins 2–3-sided; pistils scarcely emergent; stigma oblong, 0.5–0.6 mm long; stamens held just above tepals; filaments short, translucent, soon retracting to hold anthers at level of the tepals; anthers orange, (0.4)0.6 mm long, (0.5)0.8 mm wide; thecae ovoid-ellipsoid, slightly divaricate; pollen orange, faintly spicy-scented. *Infructescence* spreading to pendent; spathe usually dried; spadix to 9 cm long, 2 cm diam.; berries orange (B & K yellow-red 7/5), obovoid, rounded at apex, 9–11 mm long, 5–7.5 mm diam.; pericarp thin, lacking raphide cells; mesocarp juicy, with sparse, thick sclereids; seeds 2 (rarely 1) per berry, light brown, 3–4.5 mm long, 2.2–3 mm diam., 1.8–2.2 mm thick, enveloped by an almost translucent envelope extending to 10 mm long and as wide as seed.

Anthurium brenesii is known from 800 to 1,560 m on the Atlantic slope in the Cordillera Volcánica and the Cordillera Central in the provinces of Alajuela and Guanacaste in a premontane rainforest life zone.

This species is distinguished by its oblong to oblong-elliptic leaf blades with rather obscure primary lateral veins and the collective vein arising from the base, and by its broad spathe, cylindroid spadix, and orange berries.

Anthurium brenesii is related to *A. protensum*, with which it shares similar leaf texture and cataphylls and a similar altitudinal range. It differs from that species by its abruptly acuminate leaf blades, its short, broad spathe which is subcordate at the base, and its shorter, broader spadix. It is also similar to *A. prolatum*, but differs in having much shorter, broader leaves and a shorter, stubbier spadix and an erect, more or less ovate spathe. In contrast, *A. prolatum* has a spadix many times longer than broad (more than 50×) and a linear-lanceolate spathe.

COSTA RICA. ALAJUELA: between Naranjo and Quesada, 3.2 mi. N of Zapote on Hwy. 15, *Croat 46923* (COL, CR, DUKE, F, GH, K, MO, NY, P, PMA, RSA, SEL, U, US, VEN); La Palma de San Ramón, *Brenes 5738* (F); Reserva de San Ramón, 800–1,000 m, 10°12′53″N, 84°36′28″W, *Herrera & Mora 180* (CR, MO), *Herrera et al. 411* (B, CR, MO); Cordillera Central, ca. 15 km N of Zarcero, *Williams et al. 29034* (F). GUANACASTE: Santa Elena–Laguna de Arenal, 4 km N of El Dos de Tilarán, 1,000 m, 10°23′N, 84°53′W, *Hammel et al. 15134* (MO), *Haber & Bello 6549* (MO); Parque Nacional Rincón de la Vieja, SE slopes of Volcán Santa María, above Estación Santa María, 900–1,200 m, 10°47′N, 85°18′W, *Davidse et al. 23448* (CR, K, MO); 1,000 m, *Baker R20* (BM); 900–1,000 m, *Herrera 1609* (MO); 1,100–1,300 m, *Herrera 1405* (MO).

Anthurium bucayanum Croat, sp. nov. TYPE: Ecuador. Guayas: Río Chimbo, 0.9 km E of junction to El Triunfo at edge of General Elizalde (Bucay), 2°12′S, 79°05′W, 510 m, *Croat 61597* (holotype, MO 3422020-24; isotypes, AAU, B, BM, CAS, CM, GH, K, NY, QCA, RSA, SEL, US). Figures 66, 70–72.

Planta epiphytica aut terrestris; internodia brevia, 1.5–4 cm diam.; cataphyllum lanceolatum, persistens semi-intactum; petiolus (5.5)9–14 cm longus, 4–10 mm diam., acute D- aut C-formatus; lamina late oblanceolato-elliptica ad oblanceolatae, (38)50–112 cm longa, (10)15–26.5 cm lata; nervis primariis lateralis (13)18–26 utroque. Pedunculus 34–48 cm longus, ca. 4 mm diam.; spatha oblongo-elliptica, 13.5–15 cm longa, 3 cm lata; spadix cylindricus infirme contractus, 8.5–10 cm longus, 6–8 mm diam. prope basim, 4–5 mm diam. prope apicem, atropurpureus. Baccae 4.5–6 mm longae, 3–3.2 mm latae.

Epiphytic or terrestrial; stem to ca. 60 cm long, 1.5–4 cm diam.; roots dense, ascending, pale greenish, conspicuously pubescent, short to moderately elongate, bluntly pointed at apex, 2–5 mm diam.; cataphylls membranous, lanceolate, unribbed, 2.5–12 cm long, acute at apex with a subapical apiculum, green, drying light brown with dense raphides, persisting semi-intact, eventually deciduous. *Leaves* erect to spreading; petioles (5.5)9–14 cm long, 4–10 mm diam., acutely D-shaped to C-shaped, broadly convex adaxially with the margins sharply raised and slightly turned inward, 5–10-ribbed abaxially, the surface somewhat pale-speckled; geniculum slightly thicker and paler than petiole, fissured transversely with age, 1–2 cm long; blades subcoriaceous (very thin on drying), broadly oblanceolate-elliptic to oblanceolate, acute to shortly acuminate at apex (the acumen weakly inrolled), narrowly acute to acute to narrowly rounded at base, (38)50–112 cm long, (10)15–26.5 cm wide, broadest at or above the middle, the margins broadly and shallowly undulate; upper surface glossy to semiglossy, medium green (B & K yellow-green 4/10), lower surface semiglossy; both surfaces drying semiglossy to weakly glossy, dark green to yellow-green; midrib broadly convex to obtusely flat-raised and obscurely sulcate above, higher than broad and bluntly 3–5-ribbed at base, becoming prominently convexly raised toward the apex below; primary lateral veins (13)18–26 per side, departing midrib at 55–75° angle, straight (sometimes weakly arcuate) to the collective vein, prominently convex above and below; tertiary veins weakly visible when fresh below, prominulous when dried; collective vein arising from near the base, weakly sunken above, weakly raised below, drying weakly raised above and below, less prominent than primary lateral veins, 3–10 mm from margin. *Inflorescences* erect to erect-spreading; peduncle 34–48 cm long, ca. 4 mm diam., 3.3–4.2× as long as petiole, drying blackish brown, terete; spathe spreading-recurled, subcoriaceous, green, oblong-elliptic, 13.5–15 cm long, 3 cm wide, acute at apex; stipe 5.5–7 cm long in front, 5.3–6 cm long in back; spadix dark violet-purple, blackish when dried, weakly tapered, ± erect, curved, 8.5–10 cm long, 6–8 mm diam. near base, 4–5 mm diam. near apex; flowers square to rhombic, 1.5–2 mm long, 1.2–1.9 mm wide, the sides ± straight; (5)6–9 flowers visible in principal spiral, (8)9–12 in alternate spiral; tepals matte; lateral tepals 1.3–1.5 mm wide, the inner margins straight to concave, the outer margins 2-sided; pistils weakly exserted; stigma slitlike, ca. 0.3–0.4 mm long; anthers ca. 0.4–0.5 mm long, (0.4)0.5–0.6 mm wide; thecae oblong, not divaricate. *Infructescence* with spathe withered; spadix 17.5 cm long, ca. 1.2 cm diam.; berries (rehydrated) oblong, apparently rounded at apex, ca. 4.6–5 mm long, 3–3.2 mm diam.; seeds 2 per berry, yellow-brown with darker punctations, oblong-ovoid to somewhat broadly ellipsoid, slightly flattened laterally, 2.9–3.5 mm long, 2–2.3 mm diam., 0.9–1.5 mm thick.

Anthurium bucayanum is endemic to Ecuador, in the provinces of Guayas and Cotopaxi at 510–690 m in lower montane wet forest and premontane moist forest life zones.

This species is characterized by its epiphytic habit, its large very thin-drying, broadly oblong-oblanceolate to elliptic leaf blades which dry mostly dark green and have a collective vein arising from the base and running close to the margin, and by its prominently stipitate, curved spadix.

Anthurium bucayanum is similar in appearance to *A. campii*, with which it shares general blade shape and size and overall spadix appearance. *Anthurium campii* differs in having much more coriaceous leaf blades and a sessile, green spadix, and occurring at higher elevations (1,200–2,000 m vs. 510–690 m). *Anthurium bucayanum* also resembles *A. sparreorum* (also from lowland coastal Ecuador) in overall appearance, but the latter differs in having thicker leaf blades, a subsessile spadix and perianth which becomes fleshy and conspicuous in fruit.

The species is named for the town of Bucay, near which it was first collected.

ECUADOR. COTOPAXI: 2 km N of Pucuyacu near bridge over Río San Francisco, 690 m, 0°41'S, 79°06'W, *Croat 57082* (MO). GUAYAS: Río Chimbo, Bucay–Río Bamba, Bucay, 510 m, 2°15'S, 79°5'W, *Croat 50912* (MO); 900 m E of junction to El Triunfo at edge of General Elizalde (Bucay), Los Ríos, border of Bolívar and Chimborazo provinces, 510 m, 2°12'S, 79°5'W, *Croat 61597* (AAU, B, BM, CAS, CM, GH, K, MO, NY, QCA, RSA, SEL, US).

Anthurium bushii Croat, sp. nov. TYPE: Ecuador. Morona–Santiago: Cordillera de Cutucú, along trail from Logrono to Yaupi, *Madison et al. 3285* (holotype, SEL 014964). Figure 73.

Planta epiphytica; internodia et cataphylla ignota; petiolus 8 cm longus, 7 mm diam., D-formatus; lamina oblanceolata, ca. 100 cm longa, 18.5 cm lata; nervis primariis lateralis ca. 21 utroque. Pedunculus 36 cm longus, ca. 2 mm diam.; spatha verisimiliter lanceolata, 8 cm longa, ca. 1.3 cm lata, purpurea; spadix oblongo-cylindricus, 12 cm longus, medio ca. 4 mm diam., colore ignoto. Baccae ignotae.

Description based on dried material only. Epiphytic; stem and cataphylls unknown; petioles 8 cm long, 7 mm diam., D-shaped, with medial rib and the margins sharply raised adaxially, probably rounded abaxially; geniculum conspicuously thicker and somewhat darker than petiole, 0.7 cm long; blades subcoriaceous, oblanceolate, narrowly acute at apex, very long-attenuate at base, ca. 100 cm long, 18.5 cm wide, broadest above the middle, the margins moderately undulate; both surfaces matte, grayish green, slighty paler below; midrib ± acutely raised above, slightly paler than surface, broadly convexly raised and brownish below; primary lateral veins ca. 21 per side, departing midrib at 40–50° angle, usually straight, sometimes weakly arcuate to the margin, conspicuously raised above and below, the same color as the midrib; tertiary veins weakly visible, flat to weakly raised above and below; collective vein absent. *Inflorescences* erect; peduncle 36 cm long, ca. 2 mm diam., 4.5× as long as petiole, drying the same color as midrib, terete; spathe spreading-ascending, subcoriaceous, purple, drying brown, lanceolate, 8 cm long, ca. 1.3 cm wide, acuminate at apex (the acumen inrolled, 13 mm long), narrowly acute at base; spadix drying brownish, oblong-cylindroid, slightly curved, 12 cm long, ca. 4 mm diam. midway; flowers square to rhombic, ca. 4–7 flowers visible in principal spiral tepals ± smooth; lateral tepals 4 mm wide, the inner margins broadly convex, the outer margins 2-sided; anthers 0.4–0.5 mm long, 0.6 mm wide; thecae slightly divaricate. *Infructescence* not seen.

Anthurium bushii is known only from the type collection from the Province of Morona–Santiago in Ecuador, where it was collected in the Serranía de Cutucú at 1,300 m in a premontane moist forest life zone.

This species is characterized by its very long, oblong-oblanceolate blades which dry grayish green and are very long-tapered in the lower third, and by its purplish spathe and slender, cylindroid spadix which dries brown.

This species is probably most closely related to *A. harlingianum*, which differs in having proportionately broader leaf blades, which are mostly truncate to shallowly cordate at the base and usually dry brown.

The species is named in honor of E. O. (Mike) Bush III, former superintendent of Selby Gardens, who accompanied Michael Madison when the type collection was made. He is now at Bermuda Botanical Gardens.

ECUADOR. MORONA–SANTIAGO: Cordillera de Cutucú, W slopes, Logroño–Yaupi, 1,300 m, 2°46′S, 78°6′W, *Madison et al. 3285* (SEL).

Anthurium campii Croat, sp. nov. TYPE: Ecuador. Chimborazo: along road between Alausi and El Triunfo, 6.9 km W of Huigra, 2°19′S, 79°0′W, 1,350 m, *Croat 61562* (holotype, MO 3420768-71; isotypes, B, CM, K, NY, QCA, RSA, US). Figures 74–76, 79, 80.

Planta terrestris aut epiphytica; cataphyllum 22–40 cm longum, lanceolatum, persistens intactum vel semi-intactum; petiolus (3)17–23 cm longus, (6)10–15 mm diam., D-formatus, trapeziformis vel C-formatus; lamina late oblanceolata vel oblonga-elliptica, (46)90–145 cm longa, 23–37 cm lata; nervis primariis lateralis 14–40 utroque; nervis collectivis de basi exorientibus. Pedunculus (36)50–85 cm longus; spatha oblonga-lanceolata, (7)13–20 cm longa, 1.3–2 cm lata; spadix 12–23 cm longa, 5–9 mm diam., viridis. Baccae purpureae.

Terrestrial or epiphytic; stem short, 3.5–5.5 cm diam.; roots dense, upper ones ascending, lower ones descending, whitish to grayish, woolly-pubescent, moderately tapered, ca. 3–12 cm long, 4–5 mm diam.; cataphylls thickly coriaceous, lanceolate, 22–40 cm long, obtuse at apex, medium green, drying medium brown, persisting intact or semi-intact, eventually as coarse linear fibers. *Leaves* erect-spreading; petioles (3)17–23 cm long, (6)10–15 mm diam., thicker than broad to D-shaped to trapezoidal or C-shaped, sharply to broadly V-sulcate adaxially with the margins raised, sharply 2–9-ribbed abaxially; geniculum conspicuously thicker than petiole, 1–2.5 cm long; sheath 9–13 cm long; blades coriaceous to subcoriaceous, broadly oblanceolate to oblong-elliptic, rounded to obtuse or sometimes acute at apex, acute at base, (46)90–145 cm long, 23–37 cm wide, broadest above the middle, the margins slightly undulate; upper surface matte to semiglossy, dark green, lower surface semiglossy to glossy, paler; midrib broadly convex at base, becoming flat-raised toward the middle and narrowly convex at the apex above, trapezoidal and 3-ribbed at base, becoming acutely angled and then convex toward the apex below; primary lateral veins 14–40 per side, departing midrib at 50–70° angle, straight or slightly arcuate to the collective vein, convexly raised above, less conspicuously so below; interprimary veins sometimes present, inconspicuous to almost as conspicuous as primary lateral veins; tertiary veins darker than surface and flat below, moderately indistinct; reticulate veins prominulous above and below (or not visible) on drying; collective vein arising from or near the base, equally as prominent as primary lateral veins, 1–13 mm from margin. *Inflorescences* erect; peduncle (36)50–85 cm long, (3)5–6 mm diam., 2.5–3(6)× as long as petiole, terete to bluntly or sharply multiribbed; spathe spreading, with the margins curled under, subcoriaceous, medium green, becoming yellowish, oblong-lanceolate, (7)13–20 cm long, 1.3–2 cm wide, broadest near the base, inserted at 30° angle on peduncle, shortly acuminate at apex, acute at base; spadix medium green, sessile or shortly stipitate, cylindroid to long-tapered, erect to curved, (8)12–23 cm long, 5–9 mm diam. near base, 3–4 mm diam. near apex; flowers rhombic, 1.7–2.6 mm long, 1.1–1.9 mm wide, the sides straight to smoothly sigmoid; 6–13 flowers visible in principal spiral, 5–7 in alternate spiral; tepals matte; lateral tepals 1–1.3 mm wide, the inner margins rounded, erose, the outer margins 2-sided; pistils weakly emergent; stigma ellipsoid to broadly ellipsoid; anthers tan, 0.5–0.6 mm long, 0.6–0.7 mm wide; thecae oblong, not divaricate; pollen yellow fading to white. *Infructescence* (immature): spreading(?); spathe reflexed and persistent, green; spadix 22–30 cm long, 1.4 cm diam.; berries light purple; pericarp with raphide cells; seeds unknown.

Anthurium campii is endemic to Ecuador in southern Bolívar and southwestern Chimborazo provinces at 1,200 to 2,150 m as an epiphyte or terrestrially in either lower montane dry or premontane dry forest life zones (life zone uncertain).

This species is distinguished by its very large, broadly oblanceolate to oblong-elliptic, coriaceous leaf blades which dry green or yellowish green, its very long, thick cataphylls, and by the collective vein which arises from the lowermost portion of the blade. Its closest ally, and the only species with which it might be confused, is *A. sparreorum*, which occurs at 210–250 m in Cotopaxi and Los Ríos provinces and has shorter cataphylls (9–18 cm vs. 22–40 cm long), a much shorter, stubby, reddish violet spadix on a short peduncle, and a perianth becoming fleshy in fruit and extending beyond the red berry. *Anthurium campii* is also similar in overall appearance to *A. bucayanum*, which has very thin leaves and a long-stipitate, dark violet-purple spadix.

Anthurium campii is named in honor of Wendell H. Camp, who collected during 1944 and 1945 in Ecuador under the auspices of the New York Botanical Garden, and who was one of the first collectors of the species.

Occasional herbarium specimens of a different species have been seen bearing the name "*campii*," as proposed by A. D. Hawkes but never published. These specimens are attributable to *A. andicola* Liebm., an unrelated species of sect. *Belolonchium* from Mexico, and are not to be confused with this new Ecuadorian species.

ECUADOR. BOLÍVAR: Valle de Tablas, 1,200 m, *Acosta Solís 6075* (MO, F). CHIMBORAZO: Alausí–El Triunfo, 6.9 km W of Huigra, 1,350 m, 2°19′S, 79°0′W, *Croat 61562* (B, CM, K, MO, NY, QCA, RSA, US); Río Chanchán, 5 km N of Huigra, 1,650–2,150 m, *Camp 3428* (MO), *E-3360, E-3460* (NY).

Anthurium carchiense Croat, sp. nov. TYPE: Ecuador. Carchi: vic. Maldonado, 1,500–1,900 m, *Madison 3998* (holotype SEL-027098; isotype, MO-2925092). Figures 77, 78, 81.

Planta terrestris aut epiphytica; internodia 6–8 cm longa, 0.8–2 cm diam.; cataphyllum anguste lanceolatum, persistens fibris subtilibus et reticulatis; petiolus teres vel D-formatus 7–17(30.5) cm longus, 4–5 mm diam.; lamina oblonga aut oblanceolata, 30–57 cm longa, 2.7–6 cm diam.; nervis primariis lateralis 13–16 utroque; nervis collectivis de basi exorientibus. Pedunculus 17.5–39 cm longus; spatha 3–6.5 cm longa, 6–10 mm lata; spadix cylindricus, purpureus ad porphyreus, 2.3–6.3 cm longus, 3–5 mm diam.; stamina exserta. Baccae aurantiaco-rubrae, 6–7 mm longae, 3.2–3.4 mm diam.

Terrestrial or epiphytic; stem ca. 6–8 cm long, 0.8–2 cm diam.; leaf scars obscured by cataphyll fibers, 5–6 mm high, 1–1.3 cm wide; roots moderately numerous, generally descending, pale grayish white, drying tan, smooth, short to elongate, blunt at apex, to 14 cm long, 1–4 mm diam.; cataphylls subcoriaceous, narrowly lanceolate, unribbed, 5–9 cm long, acuminate at apex, green, drying tan to dark brown, persisting as a reticulum of fibers. *Leaves* spreading; petioles 7–17(30.5) cm long (mostly less than 16 cm long), 4–5 mm diam., terete to D-shaped, rounded to bluntly and narrowly sulcate (rarely broadly and sharply sulcate) adaxially, rounded abaxially, the surface somewhat pale-speckled; geniculum slightly paler and thicker than petiole, 0.7–2 cm long; blades subcoriaceous to coriaceous, oblong to oblong-elliptic, sometimes somewhat lanceolate or oblanceolate, long-acuminate (rarely acute) at apex, narrowly acute at base, 30–57 cm long, 2.7–6 cm wide, broadest at or slightly above the middle, the margins flat; upper surface glossy to semiglossy, dark green above, matte when dried, lower surface glossy, paler below, semiglossy when dried; both surfaces greenish to yellowish on drying; midrib acutely raised above, prominently and sharply acute below, slightly paler than surface; primary lateral veins 13–16 per side, departing midrib at 50–60° angle, ± straight-ascending to the collective vein, flat above, obscure and very weakly raised below; interprimary veins numerous, obscure above and below, drying raised and almost as conspicuous as primary lateral veins; tertiary veins visible when dried; collective vein arising from or near the base, weakly sunken above, raised below, raised above and below when dried, 3–8 mm from margin. *Inflorescences* erect to spreading; peduncle 17.5–39 cm long, drying 1–4 mm diam., 1.9–5.5× as long as petiole, green (brown when dried); spathe reflexed, subcoriaceous, pale green tinged with purple at margins, oblong-lanceolate to lanceolate, 3–6.5 cm long, 0.6–1 cm wide, broadest near the base, inserted at 45° angle on peduncle, acuminate at apex, acute at base, the margins meeting at 60–

80° angle; stipe 2–6 mm long; spadix maroon to orange-brown to brownish purple to brown (B & K yellow 4/5), cylindroid, shortly stipitate, straight or sometimes curved, 2.3–6.3 cm long, 3–5 mm diam.; flowers ± rhombic, 2–2.4 mm long, 1.5–2 mm wide, the sides straight to smoothly sigmoid on drying; 4–6 flowers visible in principal spiral, 7–9 in alternate spiral; tepals purple-red, papillate, matte; lateral tepals 0.8–1.5 mm wide, the inner margins convex, the outer margins 2-sided; pistils scarcely emergent at anthesis, raised, purple-red to dark purple; stigma slitlike, 0.5–0.6 mm long, forming droplets before stamens emerge; stamens emerging in a regular sequence, held well above tepals, the laterals followed by alternates in rapid succession, the laterals preceding the alternates by 3–4 spirals, arranged in a circle around the pistil; filaments translucent, exserted 0.7–0.8 mm, 0.2 mm wide; anthers orange to pink (B & K red 8/10), 0.2–0.3 mm long, 0.4 mm wide; thecae ovoid, 0.6–0.4 mm wide, slightly divaricate; pollen white. *Infructescence* with spathe persisting; spadix 3.5–10.5 cm long, 1–1.7 cm diam., with the berries scattered throughout; berries orange-red, ± ellipsoid to ovoid, acute at apex, (dried) 6–7 mm long, 3.2–3.4 mm diam.

A member of series *Multinervia*, *Anthurium carchiense* occurs in Ecuador in the Province of Carchí (hence the name), and in Colombia in Nariño at 1,200–2,600 m in premontane wet, premontane dry, and premontane thorn forest life zones; it presumably occurs also in premontane moist forest as well.

This species is distinguished by its small size, more or less oblong leaf blades which are long-acuminate at the apex, maroon to brownish spadix, flowers with exserted stamens, and red-orange berries.

A species similar in overall appearance, *A. obscurinervium*, differs in having a green spadix and D-shaped petioles, and generally occurs at lower elevations.

COLOMBIA. NARIÑO: Cerro Gualcala, W slopes, vic. of Tuquerres, 2,400–2,600 m, *Lehmann 5331* (F, K); La Planada, 7 km above Chucunes on road Tuquerres–Ricaurte, 1,780 m, *Croat 69571* (B, COL, K, M, MO, PSO); near Ricaurte, 1,800 m, *Gentry et al. 59681* (MO). ECUADOR. CARCHÍ: Río San Juan, Chical, 12 km below Maldonado, 1,200 m, 1°4′N, 78°17′W, *Madison et al. 4762* (K, SEL), *4812* (SEL); Chical, 1,200–1,250 m, 0°56′N, 78°11′W, *Thompson & Rawlins 995* (CM); Gualpi Chico area near Awá Ethnic encampment, 1,300 m, 0°58′N, 78°16′W, *Hoover et al. 2752, 3212* (MO); Quebrada Peñas Blancas–Quebrada Quinchul, 0°58′N, 78°12′W, *Thompson & Rawlins 1031* (CM); Maldonado, 1,500–1,900 m, *Madison 3998* (MO, SEL), *4264* (SEL); Río Chilma, Machinas–Planada de Chilma, 2,350–2,450 m, 0°52′N, 78°3′W, *Stein 2913* (MO); Río Verde, Rafael Quindís mountain finca, 1,890 m, 0°52′N, 78°08′W, *Hoover 1986, 2265* (MO); 1,870–2,400 m, 0°52′N, 78°07′W, *Hoover 2265* (MO).

Anthurium cataniapoense Croat, Aroideana 9(1–4): 18–20. 1986. TYPE: Venezuela. Amazonas: Dept. Río Negro, vic. Cerro Neblina base camp, Río Mawarinuma, 140 m, 00°50′N, 66°10′W, *Croat 59319* (holotype, MO 3401082-3; isotypes, AAU, B, CAS, COL, F, INPA, K, M, MY, US, VEN). Figures 82–85.

Epiphytic; stem 1.5–2.5 cm diam.; roots dense, spreading–ascending, ca. 3–12 cm long, ca. 3–4 mm diam.; cataphylls hook-shaped, to 6 cm long, acute and shortly apiculate at apex, drying dark brown to reddish brown, persisting as linear fibers. *Leaves* erect-spreading; petioles 6–13 cm long, 11–14 mm diam., D-shaped, flattened when young, broadly sulcate and with a prominent medial rib adaxially, 1–3-ribbed or rounded abaxially; geniculum paler and thicker than petiole, 1–1.5 cm long; sheath to 5 cm long; blades subcoriaceous, broadly elliptic-oblanceolate, acute to obtuse at apex (the acumen inrolled), narrowly acute to rounded at base, 60–117 cm long, 20–50 cm wide, broadest above the middle, the margins broadly undulate; both surfaces semiglossy, green (B & K yellow-green 6/5); midrib acutely raised, becoming higher than broad toward the apex above, concolorous with the surface, acutely raised and paler than surface below; primary lateral veins 11–16 per side, departing midrib at 40–60° angle, arcuate-ascending to the margin, weakly rounded-raised and concolorous with the surface above, obscurely raised and paler than surface below; tertiary veins flat and darker than surface below; collective vein arising from near the apex or absent, less prominent than primary lateral veins, 5–13 mm from margin. *Inflorescences* pendent; peduncle 32–53 cm long, 3–4 mm diam., (3)5–6(8)× as long as petiole; spathe spreading, subcoriaceous, green, sometimes tinged brownish or purplish adaxially, lanceolate-oblong, 9–26 cm long, 1–2.5 cm wide, acuminate at apex, acute at base; spadix maroon to dark purplish violet (B & K red-purple 2/2.5), sessile, tapered-cylindroid, slightly curved, 11.5–24.5 cm long, 3–5 mm (6.5) diam. at anthesis midway, 3 mm diam. near apex; flowers rhombic, 1.5–2.3 mm long, 1–1.6 mm wide; the sides sigmoid; 8–12 flowers visible in principal spiral, 6–13 in alternate spiral; tepals matte, smooth; lateral tepals 0.5–1 mm wide, the outer margins

2-sided, the inner margins straight to rounded; stigma linear-elliptic, 0.4–0.5 mm long; anthers 0.6–0.8 mm long, 0.6–0.8 mm wide; thecae oblong-obovoid, slightly divaricate. Fruits purple (observed by Anibal Castillo, Puerto Ayacucho).

Anthurium cataniapoense is endemic to the northern Amazon basin in Venezuela, in the basin of the Río Negro and the Río Orinoco in Amazonas and Bolívar at less than 300 m. A specimen from northern Pará in Brazil, in the Tumucumaque Mountains, also appears to belong here. The plants are epiphytic in the understory of mature, well-shaded forest, occurring on white sand soils in a tropical moist forest life zone.

This species is characterized by its broadly oblanceolate-elliptic, short-petiolate leaves which dry greenish brown to brown below and grayish brown to almost black above and have one to three pairs of primary lateral veins arising within the lower 1 cm of the base of the blade. Further characterizing the species is the slender, long-pedunculate, pendent inflorescence and the obtusely D-shaped petioles which are obtusely 1-ribbed adaxially and 1–3-ribbed or rounded abaxially.

This species is closest to *A. loretense* from the western Amazon basin in northeastern Peru, with which it shares similar leaves, hook-shaped cataphylls, and a pendent inflorescence. That species differs, however, in having a much stouter spadix and a longer, stouter peduncle.

An aberrant specimen from Bolívar (*Delascio & López 2812*) is tentatively placed here. It differs in having relatively small leaves (ca. 44 cm × 11–12 cm vs. 60–117 cm × 20–50 cm) and a shorter spadix.

BRAZIL. PARÁ: Rio Parú de Oeste (Irepecuru), *Sampaio 5158* (RB). VENEZUELA. AMAZONAS: Upper Río Negro, between Sanariapo and San Pedro, *Bunting 4249* (MO, NY); Río Orinoco, *Bunting 4248, 4250* (MO, NY); Dpt. Atures, Puerto Ayacucho Region, road to Gavilan, vic. bridge at Paseo del Diablo, 20 km SE of Puerto Ayacucho, 70–80 m, 5°33′N, 67°27′W, *Miller et al. 1596* (MO, VEN); San Pedro de Cataniapo–El Milagro, Puerto Ayacucho, 90–100 m, 6°25′N, 67°25′W, *Castillo 2229* (MO); Río Cataniapo, Las Pavas, 37 m, 06°25′N, 67°25′W, *Castillo 1650* (MO); 3 km downstream from damsite, 45 km SE of Puerto Ayacucho, 200–300 m, 05°35′N, 67°15′W, *Steyermark et al. 122191* (VEN), *122268* (MO, VEN); Puerto Ayacucho–Sanariapo, 12 km E of highway, less than 100 m, *Croat 55038* (MO); San Ferdinando de Atabapo (cultivated), *Braun 5* (VEN); Dpt. Río Negro, Cerro Neblina, 140 m, 00°50′N, 66°10′W, *Croat 59319* (AAU, B, CAS, COL, F, INPA, K, M, MO, MY, US, VEN), *Gentry & Stein 46520, 46862* (MO), *Liesner 15660* (MO), *Plowman & Thomas 13672* (MO); SW side of Cerro Neblina, 200 m, 0°49′25″N, 66°9′45″W, *Nee 30826* (MO); Río Baría, 80 m, 1°05′N, 66°25′W, *Davidse & Miller 26842* (VEN); Río Mawarinuma, 0–2 km N of Cerro Neblina Base Camp, 140 m, 0°50′N, 66°10′W, *Liesner 17384* (VEN); mouth of Cañón Grande–first major fork of Río Mawarinuma, 7 air km ENE of Puerto Chimo, 300 m, 0°50–51′N, 66°2–6′W, *Davidse & Miller 27244* (MO). BOLÍVAR: Río Suapure, Pica Caicara del Orinoco–San Juan de Manapiare, 202 km S of Caicara, 100–200 m, *Delascio & López 2797, 2812* (VEN).

Anthurium caucavallense Croat, sp. nov. TYPE: Colombia. Valle: between Cartago and San José del Palmar, 10–15 km W of Anserma-nuevo, 4°49′N, 76°02′W, 900 m, *Croat 56729* (holotype, MO 3107354; isotypes, CAS, COL, JAUM, K, NY, QCA, US; live at MO). Figures 86, 87, 91, 92.

Planta epiphytica aut terrestris; internodia brevia, 1–4 cm diam.; cataphyllum anguste triangulare, uncatum; petiolus (9)15–34 cm longus, 4–10 cm diam., plus minusve D-formatus, adaxiler complanatus ad leniter sulcatus, margine elevatus, abaxiler triplinervis-quinquenervis; lamina subcoriacea, oblanceolata ad plusminusve ellipticae, (25)50–90 cm longa, (6)10–30 cm lata, nervi primariis lateralis (9)11–20 utroque; nervo collectivo e nervis infernis primariis lateralibus exoriens. Pedunculus 23–53 cm longus, 1–2-plo bis longiorus quam petiolo; spatha oblonga-lanceolata, (8)10–23 cm longa, (1)1.5–2 cm lata; spadix violaceo-purpureus, vel e violaceo-purpureo viridis, leniter contractus, (3.7)8–21 cm longus, 7–10 mm diam. Baccae violaceo-purpureae.

Epiphytic or terrestrial; stem to 20 cm long, 1–4 cm diam.; roots dense, mostly descending, ascending at uppermost nodes, pale green, densely pubescent when fresh, moderately thick, tapered, to 5 mm diam.; cataphylls coriaceous to subcoriaceous, lanceolate and hook-shaped, 7–10 cm long, acuminate at apex, olive-green turning reddish purple, heavily short lineate throughout, drying brown, persisting as a reticulum of fibers. *Leaves* spreading; petioles (9)15–34 cm long, 4–10 mm diam., erect to spreading, ± D-shaped, flattened to weakly sulcate adaxially, the margins raised, (1)3–5-ribbed abaxially, the surface pale-speckled; geniculum paler than petiole, becoming fissured transversely with age, 1–2.5 cm long; blades subcoriaceous, oblanceolate to ± elliptic, acute to acuminate at apex (the acumen apiculate), narrowly acute to subtruncate at base, (25)50–90 cm long, (6)10–30 cm wide, broadest above the middle, the margins undulate; upper surface glossy to semiglossy, medium green, lower surface semiglossy to matte, sometimes weakly to conspicuously glaucous, paler; midrib flat at base, becoming acutely raised toward the apex above, higher than broad at base below with 1–2 blunt ridges, becoming convexly raised toward the apex; primary lateral veins (9)11–

20 per side, departing midrib at (45)70–90° angle, ± straight, convexly raised above, more prominently so below; interprimary veins few, almost as conspicuous as primary lateral veins; tertiary veins flat to sunken above, weakly raised below; collective vein arising from near the apex, occasionally in the lower third or near the base, flat to scarcely sunken above, weakly raised below, 3–5 mm from margin. *Inflorescences* erect to spreading or pendent; peduncle 23–53(83) cm long, 4–6 mm diam., 1–2(5)× as long as petiole, green often tinged with maroon, terete; spathe spreading to reflexed, subcoriaceous, olive-green tinged with maroon, oblong-lanceolate, (8)10–26 cm long, (1)1.5–2 cm wide, acuminate at apex (the acumen 5–10 mm long), acute to obtuse at base; spadix violet-purple or green tinged with gray-purple, tapered, sessile or stipitate to 7 mm long in back, (3.7)8–24 cm long, 5–10 mm diam. near base, 3–5 mm diam. near apex; flowers square to 4-lobed, 2–2.7 mm in both directions, the sides straight to jaggedly sigmoid; 5–8 flowers visible in principal spiral, 13–14 in alternate spiral; tepals matte, conspicuously papillate and with droplets; lateral tepals 0.7–1.3 mm wide, the inner margins broadly convex, the outer margins 2–3-sided; pistils emergent at anthesis, densely papillate, green; stigma slitlike to ellipsoid, 0.3–0.4 mm long; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by 3–12 spirals, the 3rd stamen preceding the 4th by 1–3 spirals, held above tepals in a circle around the pistil, sometimes partially inclined over and obscuring it; anthers white tinged with maroon, 0.6–0.8 mm long, 0.5–0.8 mm wide; thecae oblong, 0.3–0.4 mm wide, not at all or somewhat divaricate; pollen purplish violet fading to yellowish cream, sometimes faintly cinnamon-scented. *Infructescence* sessile with spathe persisting; to 41 cm long; spadix 20–25(44) cm long, 2.0–4.5 cm diam., with the berries scattered throughout; berries violet-purple, obovoid, truncate at apex, 4–6 mm long, 3–4 mm diam.; mesocarp mealy; seeds (rehydrated) oblong, ca. 5 mm long, 2 mm diam., adhering very closely to carpel wall throughout adaxial length.

Anthurium caucavallense is known only from the Cauca River Valley (hence the name) or its vicinity in the departments of Antioquia and Valle in Colombia, from 900 to 1,920 m. Terrestrial or epiphytic, it occurs in steep, dry, more or less exposed areas or in the understory of disturbed forest in the premontane wet forest life zone.

This species is distinguished by its hooked cataphylls, a more or less D-shaped petiole that is usually 3–5-ribbed abaxially, its primary lateral veins which often spread at a broad angle, by its violet-purple, cylindroid and weakly tapered spadix, and its violet-purple berries.

Anthurium caucavallense is most similar to *A. glaucospadix* in its leaf and petiole shape and habitat. The latter species, however, has straight cataphylls and bluish green, glaucous spadix. Other distinctive differences of *A. glaucospadix* are its obtuse to emarginate leaf apices and its primary lateral veins which always arise at a more acute angle.

Anthurium caucavallense may also be confused with *A. fendleri*, a species widespread in Colombia, but that species differs in its promptly withering spathe, thinner leaves, and early-emergent fruits.

COLOMBIA. Bogotá–San Agustín, *Bogner s.n.* (cultivated) (M). ANTIOQUIA: Mpo. Venecia, 4.2 km E of Bolobolo, road to Venecia, Hacienda La Plata, 920 m, 6°1′N, 75°48′W, *Zarucchi & Echeverry 4656* (B, M, MO); along road between Jerico and Tamesis, ca. 5 mi. NW of Tamesis, 05°42′N, 75°44′W, 1,920 m, *Croat 70035* (MO); along road from Salgar to El Dauro near border with Chocó, 05°59′N, 76°07′W, 1,830 m, *Croat 69896* (MO). VALLE: Calcedonia (bought; said to have been collected locally), *Croat 51984* (COL, DUKE, F, MO, NY, PMA, TEX); Cali–Buenaventura, Km 24, 1,750 m, *Escobar 2770* (HUA); between Loboguerrero and Cisneros, along Quebrada de Los Indios, 3°46′30″N, 76°42′W, 500 m, *Croat 62804* (K, M, MO, NY, US); Cartago–San José del Palmar, 10–15 km W of Ansermanuevo, 900 m, 4°49′N, 76°02′W, *Croat 56729* (CAS, COL, JAUM, K, MO, NY, QCA, US).

Anthurium colonicum K. Krause, Bot. Jahrb. Syst. 54(Beibl. 118): 123. 1916. TYPE: Panama. Colón: forest around Portobelo, 5–200 m, *Maxon 5801* (holotype, US). Figures 88, 89, 93.

Epiphytic; stem short, 5–7 cm diam.; leaf scars obscured by root mass and cataphylls, 1.5–1.8 cm high, 3.5–4 cm wide; roots moderately numerous, descending, green, smooth, slightly tapered; cataphylls coriaceous, erect, lanceolate, 20–36 cm long, acute to obtuse at apex with a subapical apiculum which appears hooked, green, drying tan (B & K yellow-red 9/10), persisting intact eventually as linear fibers or deciduous. *Leaves* spreading; petioles 26–90 cm long, subterete, narrowly to broadly and bluntly sulcate adaxially, the margins blunt, not raised, rounded abaxially, the surface pale-speckled; geniculum 2–6 cm long; blades coriaceous, ovate-triangular to oblong-ovate, short-acuminate at apex (the acumen to 30 mm long), broadly to deeply subcordate at base, 39–83 cm long, (9)13–44 cm wide, broadest below the middle, the margins undulate; anterior lobe 38–76 cm long, the posterior lobes (5.5)8–17 cm long, about as broad as long; sinus arcuate, arcuate with blade decurrent on petiole or hippocrepiform in large blades; upper surface weakly glossy to semiglossy, dark green, lower surface semiglossy to glossy, paler; midrib flat to slightly angular-raised at base, gradually becoming acutely to obtusely angular toward the apex above, prominently and convexly raised below; basal veins 2–4 pairs, usually free to base, sometimes coalesced for 1–2.5 cm; posterior rib naked, sharply turned upward on outer margin; primary lateral veins 11–17 per side, departing midrib at 50–65° angle, straight to weakly arcuate, convexly raised near the midrib, becoming sunken toward the margin above, prominently and narrowly raised and paler than surface below; interprimary veins few, weakly sunken to raised above, raised below; tertiary veins obscure or weakly sunken above, weakly raised, darker than surface below; collective vein arising from one of the lowermost primary lateral veins or 1st basal vein, sunken above, raised and darker than surface below, 3–5 mm from margin. *Inflorescences* spreading to pendent; peduncle 15–48 cm long, 6–13 mm diam., 0.5 as long as petiole, terete; spathe strongly reflexed and recurled, markedly undulate, coriaceous, dark green heavily tinged with violet-purple, lanceolate to broadly lanceolate, 10–18.5 cm long, 2.5–6 cm wide, broadest just above the base, inserted at 60–65° angle on peduncle, acuminate at apex (the acumen cuspidate), acute to obtuse at base; stipe to 1 cm long; spadix green tinged with violet-purple, sessile or sometimes stipitate, tapered, (5)15.5–28 cm long, 1.2–3 cm diam., near base, 0.7–1.7 cm diam. near apex; flowers 4-lobed, 2.3–3 mm long, 2.8–3 mm wide, the sides sigmoid; 6–11 flowers visible in principal spiral; tepals matte, punctate; lateral tepals 1.4–1.9 mm wide, the inner margins broadly convex, turned up against pistil; pistils emergent to 1–3 mm, pale green, longer than the stamens at anthesis; stigma linear, ca. 0.5 mm long, droplets appearing ca. 1 week before stamens emerge; stamens emerging from the base, lateral stamens quickly followed by alternates in rapid succession, held above tepals and against pistil; filaments fleshy, transparent, 2–2.5 mm long; anthers 0.9–1.2 mm long; thecae ovoid-ellipsoid, slightly divaricate; pollen white. *Infructescence* pendent; berries orange (B & K yellow-red 8/7.5), narrowly ovoid-ellipsoid, acute at apex, ca. 10 mm long; seeds 2 per berry, pale yellow-green, brownish at apex and base, 4–4.8 mm long, 2.3–2.5 mm diam., enveloped by sticky, amber substance.

Anthurium colonicum is endemic to Panama and ranges from Veraguas to Coclé, Panamá, and Colón provinces (also in San Blas) from near sea level to 1,150 m in tropical wet and premontane rain forest.

This species is distinguished by its relatively elongate, generally subcordate leaf blades and its frequently stubby spadix with exserted stamens, but especially by its sharply pointed, early-emergent pistils, its wavy-margined spathe, and its elongate, sharply pointed, orange berries.

Anthurium colonicum is most closely related to *A. nervatum*, which has similarly veiny leaf blades, a reflexed purplish spathe, and moderately acute orange berries. The latter differs in generally having more numerous (12–30 vs. 7–12) primary lateral veins, but especially by its straight to merely twisted (but not markedly undulate marginally) spathe and its blunt pistils, emerging with the anthers, and moderately flat tepals at anthesis. In addition, the stamens of *A. colonicum* are white to yellowish when fresh, whereas those of *A. nervatum* are orange at anthesis.

PANAMA. COCLÉ: La Pintada–Coclecito, 600 m, 8°45'N, 80°30'W, *Hamilton & Davidse 2854* (MO); Llano Grande–Coclecito: S of Cascajal, Continental Divide, 800–900 m, 8°45'N, 80°25'W, *Knapp 1946* (MO); road to Coclecito, 12 mi. from Llano Grande, 200 m, 8°47'N, 80°28'W, *Churchill et al. 4169* (MO); El Copé Region, Alto Calvario, El Potroso, *Folsom & Collins 1541* (MO); Alto Calvario, 900 m, *Folsom 2493* (MO); N of Alto Calvario, N of El Copé, Limón, 800–1,000 m, *Folsom 5820* (MO); El Valle Region, Cerro Gaital, N of El Valle, La Mesa, 800–900 m, 8°40'N, 80°7'W, *Knapp & Dressler 4912* (MO); El Valle de Antón, N of Cerro Gaital, La Mesa, 800 m, *Hammel 3868* (MO); 900–1,000 m, *Croat 67235* (MO). COLÓN: Portobelo Region, 5–200 m, *Maxon 5801* (US); Río Guanche, above bridge on Portobelo Road, 3–7 km above bridge, 50–230 m, *Croat 36943* (MO); *Davidse & D'Arcy 10077* (MO); *Hammel et al. 4901, 4925* (MO); 2 mi. E of Portobelo, Nuevo Tonosí, 100 m, *Croat 33519* (B, K, MO, NY, PMA, RSA, US); Portobelo–Nombre de Dios, Río Cascajal, 0–50 m, 9°33'N, 79°38'W, *Croat 49786* (MO); 1.2 mi. beyond junction of road to Isla Grande, 9°40'N, 79°35'W, *Croat 49812* (MO); Portobelo–Nombre de Dios, Río Indio, 50 m, *Croat 33602* (B, BM, F, M, MO, PMA, US), *Croat 33640* (MO). PANAMA: Cerro Jefe, Campo Tres, 700 m, *Croat 27096* (MO); El Llano–Cartí Road, 6.8–12 km from Pan-Am Hwy., 330–450 m, *Croat 25096A* (B, F, K, MO, NY, PMA, S, SEL, TEX, US, VEN), *25174, 33760, 49114* (CAS, MO), *67344* (MO), *Mori & Kallunki 2285* (MO), *Nee et al. 8757* (MO), *Sytsma 1724* (MO, PMA); 10 mi. from Interamerican Hwy., 350 m, *Croat 33822* (MO, PMA); San Blas, 19.1 km from Interamerican Hwy., 350 m, 9°19'N, 78°55'W, *de Nevers 4976* (MO, PMA). VERAGUAS: Santa Fe Region, Cerro Tute, near Escuela Agrícola Alto Piedra, 1,070 m, *Antonio 1984* (MO); Río Santa María, N of school, 600–750 m, *Knapp & Dressler 5388* (MO); 15 km past school, Río Caloveborita headwaters, 500 m, *Sytsma & Andersson 4762* (MO); Río

Tercero Brazo, 11 km beyond Santa Fe, 650 m, *Croat 25613* (MO); Río Dos Bocas, 11 km from school, 450 m, *Croat 27544* (F, MO).

Anthurium concolor K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 11: 606. 1932. TYPE: Panama. Colón: Río Indio de Gatun, 0–300 m, *Pittier 2798* (holotype, US). Figures 90, 94–96.

Epiphytic or epilithic; stem to ca. 25 cm long, ca. 2.5 cm diam.; roots dense, spreading to erect-ascending, pale greenish white, ca. 4 cm long, 3–5 mm diam.; cataphylls narrowly coriaceous to subcoriaceous to nearly membranous, lanceolate, sometimes hooked in the upper part, weakly 1-ribbed near apex, 11–18 cm long, acuminate at apex with a subapical apiculum ca. 6 mm long at apex, drying dark brown to reddish brown (B & K yellow-red 3/10), persisting ± intact, ultimately deciduous. *Leaves* erect; petioles (2)8–16 cm long, 10–15 mm diam., erect, D-shaped to ± quadrangular, shallowly sulcate adaxially, with thin, erect margins, prominently and unevenly 3–8-ribbed abaxially; geniculum somewhat thicker and slightly paler than petiole, 1–2 cm long; blades coriaceous to subcoriaceous, usually oblanceolate to ± elliptic, sometimes narrowly obovate, acute at apex, narrowly acute to narrowly rounded (less often rounded-subtruncate) at base, (30)40–110 cm long, (13)18–36 cm wide, broadest above the middle, the margins moderately undulate; both surfaces semiglossy, upper surface medium green (B & K yellow-green 6/7.5), drying greenish to grayish brown; lower surface moderately to conspicuously paler greenish to reddish brown (B & K yellow-green 7/10); midrib flat with medial rib at base, becoming broadly acute toward the apex below, drying reddish brown; primary lateral veins 10–17 per side, departing midrib at 50–65° angle, ascending ± straight or slightly arcuate to near the margin, prominently and convexly raised above, less so below; tertiary veins scarcely visible above, slightly darker than surface below, prominulous and raised on both surfaces when dried; reticulate veins not visible below when fresh, weakly visible when dried; collective vein arising from near the apex, less prominent than primary lateral veins, 5–10 mm from margin. *Inflorescences* arching-erect to spreading; peduncle 30–75 cm long, 5–9 mm diam., 2–4.4(11)× as long as petiole, green, sometimes purple-speckled, usually subterete, sometimes 1-ribbed; spathe reflexed, subcoriaceous, green tinged with violet-purple, narrowly oblong-ovate or oblong-elliptic 5.5–14 cm long, 1.4–3.5 cm wide, inserted at 10–70° angle on peduncle, gradually to abruptly acuminate at apex, acute to obtuse at base; spadix dark purple-violet (B & K red-purple 2/5), sometimes green tinged purple-violet, sessile or subsessile, subcylindroid or weakly tapered, 5.5–16 cm long, 7–9(12) mm diam. near base, 5–7(9) mm diam. near apex; flowers rhombic, 2–3.3 mm long, 2.4–3.5 mm wide, the sides ± straight parallel to spiral, sigmoid perpendicular to spiral; 5–9 flowers visible in principal spiral, (3)6–10 in alternate spiral; tepals matte to semiglossy weakly to conspicuously and densely punctate, forming large nectar droplets on surface at anthesis; lateral tepals 2–2.3 mm wide, the inner margins straight; pistils weakly emergent, green tinged with violet-purple; stigma broadly ellipsoid, 0.5–0.6 mm long, brushlike, droplets appearing 5–8 days before stamens emerge; stamens emerging rapidly in a scattered pattern throughout, sometimes those at apex emerging first, held barely above level of the tepals, sometimes erect when dried; anthers purplish brown to purple-violet, 0.8–1 mm long, 0.8–1.1 mm wide, in a tight cluster obscuring pistil; thecae oblong-ellipsoid, ± divaricate; pollen purplish (B & K purple 6/10). *Infructescence* pendent; spathe persisting at least in early fruit; spadix to 30 cm long, 2.5 cm diam.; berries red, obovoid, 7–8 mm long, ca. 5 mm diam.; pericarp with numerous raphide cells; mesocarp transparent, gelatinous; seeds 2 per berry, white, oblong-ellipsoid, ca. 4 mm long, ca. 1.3 mm diam.

Anthurium concolor ranges from central Panama on the Atlantic slope to northern Colombia (Chocó) from sea level to 100 m in tropical wet forest and wetter parts of tropical moist forest. It is to be expected in Costa Rica in Limón Province.

This species is distinguished by its short, cylindrical, violet-purple spadix held erect at anthesis, by its tendency to form globular droplets on the tepals, by its purplish pollen, its bright red berries, and by the petioles, which are broadly sulcate adaxially and usually prominently several-ribbed abaxially.

Anthurium concolor is apparently not closely related to any other species, but has been confused with *A. salviniae* due to similarities in leaves and habit. *Anthurium salviniae* can be readily distinguished by its long-tapered, pale lavender spadix. Because of its similar leaf and petiole shape, *A. concolor* might also be confused with *A. upalaense*, but that species has a long-tapered, green spadix, a longer, recurled spathe, and orange rather than purple anthers.

COLOMBIA. CHOCÓ: hill behind Capulgana, 0–100 m, *D'Arcy 14217* (MO). PANAMA. BOCAS DEL TORO: *Carleton 377* (US). CANAL AREA: Fort Randolph, *Standley 28723* (US); Fort Sherman, *Standley 31018* (US); Matachín–Las Cascadas, *Cowell 324* (NY). CHIRIQUÍ: Barro Colorado Island, *Croat 8154* (MO); Río Provindencia, S of Colón, *Tyson & Blum 3936* (MO), *3999* (SCZ). COLÓN: Garote (cultivated: originally collected by D'Arcy), *Croat 50108* (BM, CAS, CM, MO, PMA, SEL, S); Portobelo Region, Río Indio, *Croat 33637* (B, F, K, MO, PMA, RSA, U, US); Río Indio de Gatún, 0–300 m, *Pittier 2798* (US).

Anthurium consobrinum Schott, Oesterr. Bot. Wochenbl. 5: 66. 1855. TYPE: Nicaragua. Río San Juan: along Río San Juan, *Friedrichsthal s.n.* (destroyed; Schott Aroideae #353 serves as the type). Figures 99–101.

Anthurium consobrinum var. *cuneatissimum* Engl., Pflanzenr. IV. 23B(Heft 21): 176. 1905. *Anthurium cuneatissimum* (Engl.) Croat, Ann. Missouri Bot. Gard. 70: 285. 1983. TYPE: Costa Rica. Limón: Llanuras de Santa Clara, 250 m, *Donnell Smith 6811* (holotype, B; isotypes, K, US).

Epiphytic; stem short, 1–2 cm diam.; leaf scars conspicuous, 0.7 cm high, 0.9 cm wide; roots numerous, dense, descending to spreading or ascending, white to pale green, smooth, moderately elongate and slender, blunt, to 11 cm long, 2–4 mm diam.; cataphylls subcoriaceous, lanceolate, 5.5–15 cm long, acute to caudate-acuminate at apex, light green, drying reddish brown (B & K yellow 6/2.5), persisting intact, eventually deciduous. *Leaves* erect to spreading; petioles 2.5–9 cm long, 6–10 mm diam., D-shaped, broadly sulcate adaxially, margins blunt to sharply raised, rounded abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, becoming fissured transversely with age, 0.5–2 cm long; blades subcoriaceous, oblanceolate to broadly oblanceolate, long-acuminate at apex, attenuate to acute to narrowly rounded at base, 19–84 cm long, 3.5–21 cm wide, broadest above the middle, the margins broadly undulate; upper surface matte to semiglossy, medium green, lower surface semiglossy to glossy, slightly paler, drying matte, brown, occasionally greenish; midrib flat at base, becoming sharply acute-raised toward the apex above, higher than broad to round-raised at base below, becoming convexly raised toward the apex; primary lateral veins 12–18 per side, departing midrib at 40–60° angle, straight to near the margin, then arcuate and joining the margin, convexly raised above and below (more so below); tertiary veins obscure above, weakly visible below; collective vein arising from about the middle of the blade or absent, weakly sunken above, raised below, 5–12 mm from margin. *Inflorescences* erect to spreading, shorter than leaves; peduncle 20–43 cm long, 5–6 mm diam., 4–7× as long as petiole, medium green, terete; spathe spreading to reflexed, subcoriaceous, green, sometimes tinged with maroon, linear-lanceolate to oblong-ovate, 4.5–7.5 cm long, 0.8–2.5 cm wide, inserted at 30–90° angle on peduncle, abruptly acuminate at apex (the acumen inrolled), obtuse to rounded at base; spadix green to white, becoming pinkish to orange to tan to reddish violet, subcylindroid, prominently curved, 5.2–9 cm long, 0.8–1.5 cm diam.; flowers 4-lobed, 2–3.4 mm in both directions, the sides weakly to jaggedly sigmoid; 9–15 flowers visible in principal spiral, 12–16 in alternate spiral; tepals matte, greenish white turning pinkish tan; lateral tepals 1.1–1.3 mm wide, the inner margins broadly convex, turned up against pistil, the outer margins 3–4-sided; pistils early emergent, exserted to 2.2 mm, sharply pointed, pale green to white; stigma ellipsoid to circular, 0.5–0.7 mm long, becoming brushlike; stamens emerging slowly from the base, held above then retracting to surface of the tepals; filaments fleshy, colorless, 0.5–1 mm long, 0.6 mm wide; anthers white, 0.7–1 mm long, 0.7–1 mm wide; thecae narrowly ovoid, slightly divaricate; pollen white. *Infructescence* pendent; spadix to 13 cm long; berries greenish white, reddish to purplish at apex, ovoid, narrowly acute to prominently beaked at apex, ca. 10 mm long, 5 mm diam.; mesocarp clear, juicy; seeds 2 per berry, white to greenish white, oblong-ellipsoid, 3–3.4 mm long, 2 mm diam., 1.5 mm thick, enveloped by gelatinous, transparent substance extending ca. 1 mm beyond seed on both ends.

Anthurium consobrinum ranges from Nicaragua to Panama, from sea level to 850 m (mostly less than 450 m). It is a common species from tropical wet forest and premontane wet basal belt transition life zones on the Caribbean slope.

This species is distinguished by its oblanceolate blades; short, sulcate, and conspicuously sheathed petioles; whitish roots that are slender, sharply tapered, and often directed upward; spreading inflorescences with upturned nontapered spadix; the markedly protruding styles; and the berries that are greenish white at the base and reddish at the apex.

Anthurium consobrinum is probably most easily confused with *A. fatoense* of Costa Rica and Panama, differing from that species in its abaxially rounded petioles and nearly oblong spadix, and by its berry coloration. *Anthurium fatoense* has a quadrangular petiole, a cylindroid-tapered spadix, and pale yellow or orange berries.

This species is also similar to, and may be most closely related to, *A. acutifolium*, which differs in being terrestrial or epilithic and in having a long-tapered spadix and greenish yellow berries.

COSTA RICA. WITHOUT LOCALITY: *Taylor 11593* (NY). ALAJUELA: W of La Marina, *Molina et al. 17329* (NY, US); between Naranjo and Aguas Zarcas, NE of Quesada, *Croat 46949* (MO); Zapote, *Taylor 18163* (NY); NW of Zarcero, Finca Los Ensayos, *Croat 43615* (MO); 22 km NE of Quesada by air, 4 km W of Muelle San Carlos, 10°28'N, 84°30'W, *Liesner 14173, 14174* (MO); 4 km SE of Fortuna, then 2.5 km SW on jeep road, 400–500 m, 20°29'N, 84°43'W, *Liesner et al. 15203* (MO); San Carlos, along Río Peñas Blancas, *Haber & Bello 1754* (MO); Cañas–Upala Road, 2–4 km N of Bijagua, 400–600 m, *Almeda & Nakai 4043* (MO), *Burger & Baker 9857* (DUKE, F, MO, NY), *Croat 36264* (MO), *Wilbur 20094* (DUKE); 13.8 km N of Bijagua, 100–150 m, *Croat 36423* (MO); Bijagua, *Utley & Utley 3907* (DUKE, MO); Río Zapote, 1.8–2.7 km S of Río Canalete, 100 m, *Croat 36383* (MO); Miravalles, above Bijagua, 850 m, *Gomez et al. 19065* (MO). GUANACASTE: Río Las Flores, Quebrada Desprendimiento–Quebrada Sanguijuela, Hacienda Montezuma, 450 m, *Grayum et al. 4878* (CM, CR, MO, NY); Santa María National Park, 600 m, 10°37'N, 85°17'W, *Liesner 5072* (MO). HEREDIA: E of Río Sarapiquí, Tirimbina, 150–250 m, 10°24'N, 84°7'W, *Burger & Burger 8090* (F, MO), *Proctor 32168* (LL, MO); N of Quebrada Tigre, NE of Finca El Plástico, 8 km SW of Las Horquetas, 450–550 m, 10°18'N, 84°02'W, *Grayum & Sleeper 6527* (MO); Río Peje–Río Sardinalito, Atlantic slope of Volcán Barva, 700–750 m, 10°17.5'N, 84°04.5'W, *Grayum & Jermy 6786* (MO); Finca La Selva, OTS Field Station on Río Puerto Viejo, just E of its junction with Río Sarapiquí, 100 m, *Almeda et al. 5101* (CAS), *Croat 44304* (MO), *Hammel 11627* (MO), *Jacobs 2087, 2337, 2469* (DUKE); 50 m, *Lesica & Antibus 4134* (MO), *McDowell 132, 399* (MO), *750* (DUKE, MO), *Sperry 622* (MO), *Wilbur 37240, 37624, 37730* (DUKE), *Wilbur & Jacobs 34205, 34963* (DUKE); Puerto Viejo Region, Río Sucio, 20 m, *Croat 35671, 35695* (MO); Puerto Viejo, *Burger & Stolze 5934* (PMA), *Garwood et al. 883* (BM, MO), *Taylor 4571* (NY); 4.5 km SE of bridge at Puerto Viejo, 50 m, 10°26'N, 83°58'W, *Stevens 13494* (MO); San José–Puerto Viejo, vic. Chilamente, 11.6 mi. N of Cariblanco, 10°27'N, 84°05'W, 100 m, *Croat 68360* (MO). LIMÓN: Cahuita–Limón, 0–10 m, 9°44'N, 83°2'W, *Baker & Burger 151* (BM, CAS, CM, F, MO, US); Finca Castilla, 30 m, *Dodge & Goerger s.n.* (MO); 29 air km W of Tortuguero, Hacienda Tapezco and Hacienda La Suerte, 40 m, 10°30'N, 83°47'W, *Davidson et al. 6723, 6768* (MO), *Davidson & Donahue 8413, 8461, 8733* (MO); Parque Tortugero, 40 m, 10°10'N, 83°34'W, *Robles 1159, 1233* (MO); 10–80 m, 10°31'N, 83°01'W, *1518* (MO); between Barra del Colorado and ocean beach, 0–2 m, 10°47'N, 83°35'W, *Stevens 24138A* (MO); hills 2 air km SSE of Islas Buena Vista in Río Colorado, 14 air km SW of Barra del Colorada, 10–120 m, 10°40'N, 83°40'W, *Davidse & Herrera 31058* (MO, U); Cerro Coronel, E of Laguna Danto, 20–170 m, 10°41'N, 83°38'W, *Stevens 23654* (MO); Río Colorado, 2 km upstream from downstream branch of Caño Bravo, 5 m, 10°43'N, 83°40'W, *Stevens 24032* (MO). NICARAGUA. CHONTALES: 4 km NW of Santo Domingo, 280 m, 12°17'N, 85°6'N, *Grijalva et al. 3811* (MO). GRANADA: N of Mombacho, San José, 700–800 m, 11°49'N, 85°58'W, *Sandino 2508* (MO). MATAGALPA: NE side of Cerro Peñas Blancas, Matagalpa–Waslala, *Grijalva & Moreno 3461* (MO). RÍO SAN JUAN: 20 km NE of El Castillo, Río Indio watershed, 200 m, *Neill 3421* (MO); 3 km from confluence of Río San Juan and Río Sábalo, Sábalo, 40–50 m, *Araquistain 3229* (MO); 2 km NW of Sábalos, 70 m, 11°2'N, 84°29'W, *Moreno 23281* (MO); 2 km W of Santa Eduviges, Río Sabalós, 70–80 m, 11°3'N, 84°29'W, *Moreno 23017, 23037* (MO); Caño Chontaleño, 20 km NE of El Castillo, 200 m, *Neill 3332, 3376, 3420* (MO), *Neill & Vincelli 3488* (MO, TEX), *3622* (MO); Cerro El Gigante, Castillito–Caño de Oro, 10 m, 10°43–44'N, 84°54'30"W, *Martínez 2167* (MEXU); Río Santa Cruz at confluence with Río San Juan, 42 m, 11°2'N, 84°24'W, *Moreno 25532* (MO). ZELAYA: 6.3 km S of bridge at Colonia Yolaina, SW of Colonia Naciones Unidas, 200–300 m, 11°36'N, 84°22'W, *Miller & Sandino 1100* (MO); *Stevens 4819, 4826, 6411, 6412* (MO); 1.3 km SE of intersection with road Nueva Guinea–Colonia Verdún, road to Colonia Yolaina, Colonia La Esperanza, 180–200 m, 11°40'N, 84°26'W, *Stevens 6308* (MO); road to Colonia Yolaina and Colonia La Esperanza, 180–200 m, *Vincelli 166, 168* (MO); 1.5 km SE of Estación Experimental "El Recreo," *Soza et al. 448* (MO); Colonia Yolaina, Nueva Guinea, 300 m, 11°38'N, 84°21'W, *Araquistain 3126* (MO); 1 km N of El Zapote, 6 km S of Colonia Verdún, 250–300 m, 11°34'N, 84°24'W, *Nee & Vega 27907* (MO); Bluefields, N of Base Camp, *Proctor et al. 26913, 27010* (LL, MICH, NY, US); Caño Costa Riquita, 1.8 km SW of Colonia Naciones Unidas, 150–180 m, 11°43'N, 84°18'W, *Stevens 4966, 5058* (MO); Caño Monte Cristo, 10 m, 11°33'N, 87°48'W, *Moreno & Sandino 14704* (MO); Cerro Las Nubes, 10–60 m, 11°37'N, 83°52'W, *Moreno 14975* (MO); Las Faldas, 40–60 m, 11°36'N, 83°51'W, *Moreno 14811* (MO); German Pomares–Las Benitas, 100 m, 11°36'N, 83°51'W, *Moreno & Sandino 14878, 14923* (MO); 1 km before German Pomares, 10 m, 11°35'N, 83°51'W, *Moreno 14840* (MO); Caño Monte Cristo and Caño El Consuelo confluence, 10 m, 11°35'N, 83°51'W, *Moreno 15033* (MO); Quebrada La Talolinga, 170 m, 11°51–52'N, 84°26–27'W, *Miller & Sandino 1176, 1178* (MO); Río Punta Gorda, Atlanta, "La Richard," 20–30 m, 11°32'N, 84°5'W, *Moreno & Sandino 12967, 13008, 13114* (MO); Atlanta, "La Richard," Loma San Jorge, 150–160 m, 11°31'N, 84°4'W, *Moreno & Sandino 13041* (MO); Río Rama, Caño Zamora, 10 m, 11°57'N, 84°16'W, *Stevens 8861* (MO); Salto La Oropendola, 15–25 m, 11°57'N, 84°17'W, *Stevens 8954* (MO). PANAMA. COLÓN: between Portobelo and Madre de Dios, 1.2 mi. beyond junction to Isla Grande, 9°40'N, 79°35'W, *Croat 49812* (MO). VERAGUAS: Santa Fe Region, Cerro Tute, vic. Escuela Agrícola Alto Piedra, 600–1,400 m, 8°30–32'N, 81°07'W, *Knapp & Kress 4357* (B, MO), *Knapp & Dressler 5435* (B, MO), *McPherson 10722* (MO).

Anthurium coriaceum G. Don in Sweet, Hort. Brit. ed. 3. 633. 1839. Figures 97, 98, 102.

Pothos coriacea Graham, Edinb. Phil. J. 14: 353. 1826, non Salisb. (1796). TYPE: Brazil. Rio de Janeiro: *Harris s.n.* (cult. Kew).

Anthurium coriaceum [Endlicher, Gen. Pl. 240. 1837, comb. not made under ICBN Art. 33.1] G. Don in Sweet, Hort. Brit. ed. 3. 633. 1839.
Anthurium glaucum Schott, Wiener Z. Kunst 1829(3): 828. 1829, nomen nudum.
Anthurium glaucescens Kunth, Enum. Pl. 3: 73. 1841. TYPE: Origin unknown (type not designated).
Pothos glaucus Schott ex Kunth, Enum. Pl. 3: 73. 1841, invalidly published in synonymy.
Pothos subcaulescens Vell. Conc., Fl. Flum. Archivos do Mus. Nac. 390. 1881. TYPE: Brazil. exact location unknown. Plate 122 in Flora Flumiensis 1825 [1829] serves as the type.
Anthurium rubriflorum Engl., Bot. Jahrb. Syst. 25: 399. 1898. TYPE: Brazil. Rio de Janeiro: Gavea, Glaziou 71 (cult. Berlin) (holotype, B).
Anthurium subcaulescens (Vell. Conc.) Stellfeld, Arq. Mus. Paran. 8: 177. 1950.

Terrestrial or epilithic, sometimes epiphytic; stem less than 20 cm long, 1.5–3.5 cm diam.; roots mostly descending, to 5 mm diam.; cataphylls coriaceous, unribbed, broadly lanceolate, 12–14 cm long, acute to obtuse at apex, drying straw-colored, becoming brown toward base, persisting semi-intact. *Leaves* erect-spreading; petioles (3)19–60 cm long, (4)10–15 mm diam., terete, sometimes obtusely flattened adaxially, the surface sometimes pale-speckled; geniculum moderately thicker and paler than petiole, 1–2.5 cm long; sheath 4–5.5 cm long; blades coriaceous, broadly elliptic to somewhat oblong, sometimes somewhat lanceolate or oblanceolate, acute to rounded and minutely apiculate at apex, acute to obtuse or rounded (rarely shallowly cordate) at base, (35)60–110 cm long, (6)15–28(39) cm wide, broadest usually above the middle, the margins moderately undulate; upper surface matte to weakly glossy, medium green, lower surface semiglossy, slightly paler; midrib above flat to broadly convex at base, becoming convexly to acutely raised toward apex, prominently convex below; primary lateral veins numerous, departing midrib at (40)50–70(80)° angle, straight to slightly arcuate to the collective vein, weakly sunken to weakly raised and obscure above, similar but more visible below, raised above and below when dried; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins prominulous above and below on drying; collective vein arising near the base, equally as prominent as primary lateral veins, 5–20(30) mm from margin. *Inflorescences* erect; peduncle 11–44 cm long, (3)5–9 mm diam., (0.2)0.5–1.7(3.6)× as long as petiole, terete; spathe erect, coriaceous, green, broadly lanceolate-elliptic, (7.5)10–24 cm long, (1.7)2.5–4.3 cm wide, broadest near the base, acute to acuminate at apex, acute at base; spadix pale purplish to maroon, sessile, tapered, erect, straight to slightly curved, 10–31 cm long, 8–12 mm diam. midway, 4–5 mm diam. near apex; flowers rhombic, 2.5–3.1 mm long, 1.8–2 mm wide, the sides straight to weakly sigmoid; 13–23 flowers visible in principal spiral, 8–14 in alternate spiral; tepals matte, smooth; lateral tepals 1.6–2 mm wide, the outer margins 2-sided, the inner margins rounded; stigma oblong-ellipsoid, 0.5 mm long, depressed medially; anthers 0.5–0.7 mm long, 0.6–0.7 mm wide, inclined over and obscuring pistil; thecae ovoid-oblong, slightly or not divaricate; pollen pale yellow on drying. *Infructescence* erect; spathe persisting; spadix to 18 cm long, 2 cm diam., with the berries scattered throughout; berries dirty white to pale lavender, greenish at apex, obovoid-oblong, truncate at apex, 7 mm long, 5 mm diam., the pericarp with raphide cells; seeds 2 per berry, ovoid-ellipsoid, 4.5–5 mm long, 3–3.5 mm wide, 1.7–2 mm thick, flattened on one side, oblique and with a short, hooked appendage at apex.

Anthurium coriaceum is endemic to coastal southeastern Brazil, ranging from central Espírito Santo to Guanabara with a single outlying collection on Dos Corais Islands off the coast of Paraná State. It is expected in some of the few remaining natural areas along the coast between Rio de Janeiro and Paraná states. The species occurs terrestrially, or on rocks, less often epiphytically, in dry areas on windward slopes below 500 m.

This species is readily distinguished by its large, coriaceous, green-drying, more or less matte leaf blades with numerous primary lateral veins that are as conspicuous as the interprimary veins, and a collective vein which arises from near the base and is remote from the margin. The peduncle may be shorter or slightly longer than the petioles.

Anthurium coriaceum is not closely related to or confused with any other species. In some respects (especially venation), it is like members of sect. *Urospadix*, which are especially common in this part of Brazil, but has involute vernation and thus shows its affinity with sect. *Pachyneurium*.

BRAZIL. WITHOUT LOCALITY: *Glaziou 71* (B (cult. Berlin)), *15575*, *16519* (C), *s.n.* (F, US), *Warming s.n.* (C), *Widgren 1081* (S), *Lassen s.n.* (C). ESPIRÍTO SANTO: along Hwy. BR-259 between Colatina and Vitória, at km 38.5 from junction of BR-259 and BR-101, 14.2 km E of Colatina, 19°33′S, 40°36′W, 160 m, *Croat 61907* (MO, R); Domingos Martins, Fazenda Kautsky, 550–860 m, *Croat 61815* (R). GUANABARA: Barra da Tijuca, *Pabst & Klein 5228* (B); Gavea, *Ule 4872* (HBG). PARANÁ: Ilha dos Corais, *Hatschbach 32538* (MO, NY). RIO DE JANEIRO: without locality, *Glaziou 17335* (K); Pão de Açúcar, Costão, 200 m, *Carauta 429* (GUA), *Casari & Vilaca 105* (GUA); Leme, Morro do Leme, *Kennedy 838* (F); Mpo. Niteroi, Alto Moinas, Praia de Itaipucu, 100–250 m, 22°53′S, 43°07′W, *Croat 53757* (CM, K, MO, NY, RSA), *53781* (MO); Itaipu, Morro das Andorinhas, *Araujo & Vilaca 3847* (GUA); Represa do Camorim, *Araujo 3751* (GUA); road to Represa do Camorim, Estrada da Boca do Mato, Vergem Grande, *Rocha 151* (GUA); Cabo Frio, Arraial do Cabo, Pontal beach, *Segadas-Vianna et al. 665* (NY). SÃO PAULO: cultivated at Floricultura Campina Hda., *Hutchison 8850* (MO).

Anthurium cotobrusii Croat & R. A. Baker, Brenesia 16(Suppl. 1): 43. 1979. TYPE: Panama. Chiriquí: above San Félix, along mining road, 18–27 mi. off Pan-Am Hwy., 1,200–1,500 m, *Croat 33058* (holotype, MO 2381190-91; isotypes, AAU, B, CAS, CM, COL, CR, DUKE, F, GH, K, L, M, MBM, MEXU, NY, P, PMA, RSA, SEL, US, W). Figures 107, 108.

Terrestrial or often epilithic; stem usually less than 15 cm long, 1–3 cm diam.; roots descending, greenish or grayish brown, smooth to weakly pubescent, moderately thick and elongate, to 6 mm diam.; cataphylls subcoriaceous, lanceolate, 4.5–11 cm long, acute at apex, green, sometimes tinged with purplish, drying light brown, persisting semi-intact, eventually as fine linear fibers. *Leaves* erect to spreading; petioles 15–65 cm long, 4–7 mm diam., ± terete, weakly sulcate to flattened adaxially, rounded abaxially; geniculum thicker than petiole, (1)3–5 cm long; blades subcoriaceous, narrowly ovate to triangular, long-acuminate at apex (the acumen downturned, weakly apiculate), shallowly and broadly cordate at base, 16–65 cm long, 9.5–33 cm wide, broadest at base, the margins weakly undulate; anterior lobe (13)18–30(37) cm long, the posterior lobes (5)7–13(15) cm long, directed upward and slightly inward, narrowly rounded at apex; sinus arcuate to broadly parabolic when flattened, hippocrepiform when not, (4)7–9 cm deep; upper surface semiglossy, dark to medium green, lower surface glossy to semiglossy, conspicuously paler, both drying matte to weakly glossy, yellowish green; midrib obtusely raised at base, becoming more sharply raised and then sunken at apex above, obtusely to convexly raised and more prominent below; basal veins 3–5 pairs, all free to base or 3rd–4th coalesced 4–6 cm, weakly raised to flat above, weakly raised and darker than surface below; posterior rib naked, gradually curved to almost straight, turned up on outer margin; primary lateral veins 4–8 per side, departing midrib at 50–60° angle, broadly arcuate, sharply to weakly raised or weakly sunken above, weakly raised to flat and darker than surface below; interprimary veins obscure above, flat and darker than surface below; tertiary veins obscure above, weakly visible below; reticulate veins obscure above and below; collective vein arising from one of the uppermost basal veins or one of the lowermost primary lateral veins, sunken above, slightly raised and darker than surface below, almost as prominent as primary lateral veins, 3–8 mm from margin. *Inflorescences* erect-spreading; peduncle (4)20–60 cm long, 4–10 mm diam., (0.7)1–1.7× as long as petiole, terete; spathe reflexed, subcoriaceous, green to pale green or green with purplish veins or heavily suffused with purple on inner surface, sometimes tinged with purple only at base, ovate to narrowly ovate, weakly boat-shaped to flat, (2.5)5–15 cm long, (1.7)2.7–4.5 cm wide, inserted at 60–90° angle on peduncle, acuminate at apex (the acumen inrolled), acute to rounded or shallowly cordate at base; stipe 1–2 cm long in front, 2–6 mm long in back; spadix green to brownish green to dark purple-violet, cylindroid to weakly tapered, erect to curved, (2.5)5–25 cm long, 7–15 mm diam. near base, 3–7 mm diam. near apex; flowers ± 4-lobed, 3.5–5 mm long, 3.5–4 mm wide; 3–6 flowers visible in principal spiral, 7–10 in alternate spiral; tepals sparsely punctate, more densely so near the margins, semiglossy to matte, the inner margins broadly convex; pistils emergent, matte, green; stigma linear, purple-violet or green, ca. 0.6 mm long, with brushlike papillae; droplets appearing 1–3 weeks before stamens emerge, sometimes persisting when 1st and 2nd stamens are opening; stamens weakly exserted, in a tight cluster above pistil; filaments whitish, soon retracting, 0.4 mm long, 1 mm wide; anthers orange to yellowish, 0.6–0.9 mm long, 1 mm wide; pollen pale orange fading to white, yeasty-scented. *Infructescence* erect spreading; spathe persisting; spadix 12–18 cm long, 1.5–2 cm diam.; berries pale orange (B & K yellow-red 8/7.5), obovoid, darker and rounded at apex with radial ridges, 12–15 mm long, 8–11 mm diam.; mesocarp juicy, orange; seeds usually 2 per berry, oblong-ellipsoid, 6.5–7.5 mm long, 2.5–4 mm diam., encased in flattened, translucent envelope that projects up to 3 mm beyond the apex of the seed and up to 1 mm beyond the lateral margins.

Anthurium cotobusii is found in Costa Rica and Panama, in premontane wet forest at elevations of 600 to 1,850 m.

This species is most easly distinguished by its subcoriaceous leaves which have more or less obscure reticulate veins when dried, and by its prominently tapered, violet-purple spadix with stamens in tight clusters. In the dried state the flowers have their tepals turned somewhat upwards, which, in conjunction with the clustered stamens, gives the spadix a rough appearance. Other diagnostic features are the primary lateral veins often free to the margin in the basal half of the blade, the thick, grayish roots that are densely long-pubescent on drying and the early emergent berries that are quadrangular with prominent ridges radiating from the center to the corners.

Anthurium cotobrusii is an atypical member of sect. *Pachyneurium*, probably related to other cordate and subcordate, orange-fruited species such as *A. colonicum*, *A. nervatum*, *A. ranchoanum*, and *A. watermaliense*.

Specimens of *A. cotobrusii* with longer posterior lobes can be confused with *A. watermaliense*, but that species is distinguished by its early emergent pistils held above the tepals before anthesis, and by its often persistently long-exserted stamens.

The species was placed in sect. *Cardiolonchium* by Croat & Baker (1979) and later in sect. *Belolonchium* (Croat, 1983), but was confirmed as a member of sect. *Pachyneurium* by its involute vernation.

COSTA RICA. PUNTARENAS: Las Cruces–Neily, Fila de Cal, *Gómez 19649* (CR, MO); Río Coto Brus, 23 km N of La Unión, Panama border, *Croat 26674* (MO); San Vito de Coto Brus–Villa Neily, Fila de Cal, Cuesta Fila de Cal, 300–600 m, 8°41′N, 82°56.5′W, *Hammel 14160* (MO); Cordillera de Talamanca, Tres Colinas, 1,800–1,850 m, 9°7′N, 83°4′W, *Davidse et al. 25652* (MO); Cerro Frantzius–Cerro Pittier, Río Canasta, 9.5 air km NW of Agua Caliente, 1,500–1,600 m, 9°2′N, 82°59′W, *Davidse et al. 28366* (MO); Cerro Pando, 1,000–1,800 m, 8°55′N, 82°45′W, *Barringer & Gómez 1617* (F); Refugio de Fauna Silvestre, Peñas Blancas de Esparza, 1,000–1,400 m, 10°7′50″N, 84°40′25″W, *Herrera et al 295* (DUKE, F, MO, TEX, US); cultivated at Las Cruces Botanical Garden, 1,300 m, *Croat 44452* (MO); originally from Las Alturas, *Croat 44387* (MO). PANAMA. CHIRIQUÍ: above San Félix along mining road 18–27 mi. off Pan-Am Hwy., above Chamí or turnoff to Escopeta, 1,200–1,500 m, *Croat 33058* (AAU, B, CAS, CM, COL, CR, DUKE, F, GH, K, L, M, MBM, MEXU, MO, NY, P, PMA, RSA, SEL, US, W), *33147A*, *33152* (MO); Cerro Colorado, 7.6 km from main road, 1,450–1,750 m, *Folsom et al. 4840* (MO); 17 km NE of San Félix, 13–14 km by road NE of bridge over Río San Félix, 1,000 m, *Nee 10699* (MO); Cerro Hornito, beyond Gualaca, 2–3 km E of Finca Linares, vic. Planes de Hornito, 1,400–1,900 m, *Croat 48850* (CM, COL, CR, ENCB, LE, M, MO, U); 1,750–1,900 m, 8°41′N, 82°10′W, *Croat 67983* (MO).

Anthurium cowanii Croat, sp. nov. TYPE: British Guiana. Kaieteur Plateau, forest along Potaro River, ca. 1 mi. above Kaieteur Falls, 470 m, *Cowan & Soderstrom 2230* (holotype, BH; isotypes, K, NY, US). Figure 103.

Planta epiphytica; internodiis brevibus, caule 1–1.5 cm diam.; cataphyllum persistens semi-intactum; petiolus 8.5–13 cm longus, 7–10 mm diam., D-formatus; lamina oblanceolata, 50–90 cm longa, 13.5–30 cm lata; pedunculus 49–63.5 cm longus, 3–7 mm diam.; spatha 9–16 cm longa, 1.5–2.5 cm lata; spadix stipitatis, (9)15–18(21) cm longis, 6–7(10) mm diam., atropurpureus-rubescens ad brunneo-rubescens. Baccae ignotae.

Description based on dried material only. Epiphytic; stem ca. 1–1.5 cm diam.; roots dense, numerous, grayish brown, somewhat pubescent, ca. 2–3 mm diam.; cataphylls apparently subcoriaceous, at least 8 cm long, acute at apex, brown (B & K yellow 4/2.5), persisting semi-intact, eventually as fine linear fibers; petioles 8.5–13 cm long, 7–10 mm diam., D-shaped, apparently sulcate adaxially, with the margins prominently raised, probably rounded abaxially; geniculum slightly thicker than petiole, 0.8–1.7 cm long; sheath (2.5)5.7–6.5 cm long; blades coriaceous, oblanceolate, acute to shortly acuminate at apex, narrowly rounded to obtuse at base, 50–90 cm long, 13.5–30 cm wide, broadest above the middle, the margins apparently undulate; both surfaces semiglossy to weakly glossy, grayish green to brownish green; midrib convexly raised above, slightly paler than surface, prominently convex to higher than broad below, somewhat darker than surface; primary lateral veins 9–16 per side, departing midrib at 25–50° angle, straight, becoming somewhat arcuate toward the apex, prominently convex above and below, more so below; interprimary veins not present; tertiary veins prominulous, raised above and below; reticulate veins weakly raised; collective vein arising from near the apex, raised above and below, 3–11 mm from margin. *Inflorescences* with peduncle 49–63.5 cm long, 3–7 mm diam., 6.1–7.5× as long as petiole, probably terete; spathe apparently erect to spreading, coriaceous, green, oblong-lanceolate, 9–16 cm long, 1.5–2.5 cm wide, broadest near the base, shortly acuminate at apex (the acumen inrolled, 7–15 mm long), acute at base; stipe 1.5–4(7) cm long in front, 0.5–1.5(2.5) cm long in back; spadix dark purple-red to brown-red, long-tapered, somewhat curved, held at 150–165° angle from peduncle, (9)15–18(21) cm long, 6–7(10) mm diam. near base, 4–6 mm diam. near apex; flowers rhombic, 4–4.6 mm long, 2.5–2.8 mm wide, the sides straight; 7–8 flowers visible in principal spiral, 5–6 in alternate spiral; tepals minutely papillate, semiglossy on drying; lateral tepals 2.3–2.8 mm wide, the inner margins broadly rounded, the outer margins 2-sided; pistils minutely papillate; stigma slitlike, 0.4–0.5 mm long; anthers 0.4–0.5 mm long, 0.5–0.6 mm wide, contiguous, obscuring pistil; thecae oblong, not at all or slightly divaricate; pollen fading to white. Fruit unknown.

Anthurium cowanii is known only from the Kaieteur Plateau in gallery forest along the Potaro River in Guyana at 470 m, where it was reported as an epiphyte in a premontane moist forest life zone (though the area is mostly savanna).

This species is characterized by its large, oblanceolate and short-petiolate leaf blades which dry greenish gray above and more brown and semiglossy below. Also, the dark purple-red, tapered spadix on a peduncle much longer than the petioles is an important distinctive feature. *Anthurium cowanii* is not likely to be easily confused with any other species, but *A. loretense* and *A. vaupesianum*, from lowland western Amazonia, may bear a resemblance in the color of the leaf blades on drying.

Anthurium cowanii has been cultivated at the New York Botanical Garden. An herbarium voucher at NY, prepared in 1948, was made from a living plant brought back as *Maguire & Fanshawe 26173*, from the Potaro River Gorge, but no field voucher has been located. The cultivated specimen resembles field-prepared specimens of *A. cowanii* quite well, but leaf blade shape is more obovate-oblanceolate (vs. oblanceolate).

The species is named in honor of Richard S. Cowan, who collected in the Guiana region in the early 1950s and early 1960s and who, with T. R. Soderstrom, collected most of the known material of *A. cowanii*.

GUYANA. Kaieteur Plateau, Potaro River, ca. 1 mi. above Kaieteur Falls, 470 m, *Cowan & Soderstrom 2230* (BH, K, NY, US), *1758* (BH, US); (cultivated), *Maguire & Fanshawe 26173* (NY).

Anthurium crassinervium (Jacq.) Schott, Weiner Zeitschr. 1825: 828. 1825. *Pothos crassinervia* Jacq., Icon. Pl. Rar. 3 (1793), t. 609, Coll. 4. 122. TYPE: t. 609 serves as the type. Figures 104, 105, 109, 110.

Anthurium ellipticum K. Koch & Bouché, Ind. Sem. Hort. Berol. App. 6. 1853. TYPE: Venezuela. Caracas, *Gollmer s.n.* (lectotype, B; photo seen (Field Mus. Neg. #F-011915)).

Anthurium rugosum Schott, Oesterr. Bot. Z. 8: 387. 1858. TYPE: Venezuela: Caracas, *Gollmer s.n.* (B, lectotype; photo seen (Field Mus. Neg. #F-012065)).

Anthurium egregium Schott, Prodr. 475. 1860. TYPE: Schott Aroideae 486 (microfiche #13 A 10) serves as the lectotype (W).

Anthurium fontanesii Schott, Bonplandia 10: 347. 1862. TYPE: Locality unknown, from a cultivated source; Field Museum Photo 29816 serves as the type.

Anthurium preussii Engl., Pflanzenr., IV. 23B(Heft 21): 68. 1905. TYPE: Venezuela. Carabobo: Porto Cabello, *Preuss 1552* (holotype, B; isotype, BM).

Epiphytic, epilithic or terrestrial, sometimes colonial; stem short, 2.5–4 cm diam.; roots dense, ascending, smooth; cataphylls subcoriaceous, 7–13 cm long, acute at apex, drying medium brown (B & K yellow 4/7.5), persisting ± intact, weathering into reticulum of fibers. *Leaves* erect to spreading; petioles 3–33.5 cm long, 4–11 mm diam., D-shaped to quadrangular or thicker than broad, broadly and shallowly sulcate to V-sulcate, rarely narrowly sulcate adaxially, the margins acute, rarely inclined inward, flattened to rounded or 3–5-ribbed abaxially; geniculum somewhat thicker and paler than petiole, 0.8–2 cm long; blades moderately coriaceous, oblanceolate, gradually acuminate or rarely rounded at apex, acute to somewhat obtuse at base, 25–142 cm long, 11–52 cm wide, broadest usually above the middle, the margins undulate; both surfaces matte to semiglossy, slightly paler below, often pale-pustulate and/or with pale or dark punctations; midrib flat with a conspicuous medial rib near the base above, becoming acutely raised near the middle, sharply raised below, sometimes 3-ribbed at base; primary lateral veins 6–14 per side, departing midrib at 40–70° angle, ± straight or arcuate to the margin, prominently raised near the midrib above, then sunken and merging with margin, raised below, drying raised and paler on both surfaces; interprimary veins not apparent; tertiary veins flat and slightly visible above, visible and darker than surface below; collective vein arising in the upper ⅓ or in the upper ¼ of the blade, prominulous when dried. *Inflorescences* erect to spreading; peduncle (13)20–98 cm long, 5–12 mm diam., 1–3(5)× as long as petiole, terete, sometimes ribbed near the base of spathe; spathe spreading to reflexed, moderately thin, green, sometimes tinged with purple, lanceolate, 8–12.5 cm long, 1.5–2 cm wide, broadest near the base, often decurrent at base; spadix dark purple or violet to green or green tinged with purple, tapered, sessile or stipitate to 12 mm, (6)12–

33 cm long, 7–10 mm diam. near base, 4–7 mm diam. near apex; flowers rhombic to 4-lobed, 2.4–3.1 mm long, 1.6–2.8 mm wide, the sides jaggedly sigmoid; 7–10 flowers visible in principal spiral, 5–10 in alternate spiral; tepals matte; lateral tepals 1.2–1.5 mm wide, the inner margins rounded, tinged with violet-purple; pistils emergent, violet-purple; stigma linear, 0.5 mm long; stamens emerging from the base of the spadix, laterals emerging to midway followed by alternates in rapid succession, arranged in a circle around the pistil just above the tepals; anthers pale orange (B & K yellow-red 8/7.5) 0.7 mm long, 1 mm wide; thecae ovoid, slightly divaricate; pollen pale orange, white when dried. *Infructescence* pendent; berries red, ovoid, basally attached to spadix by 4 tepalar fibers, 7.6–8.2 mm long, 3–3.5 mm diam. on rehydration; pericarp studded with raphide cells; seeds 1–2 per berry, pale yellowish, with raphide cells, ellipsoid, 3.6–4.4 mm long, 1.6–2.2 mm diam., 0.8–1.6 mm thick, with a mucilaginous apical appendage.

Anthurium crassinervium ranges throughout northern Venezuela in the states of Aragua, Carabobo, Falcón, Lara, Mérida, Miranda, Portuguesa, Táchira, Trujillo, Yaracuy, Zulia, and the Distrito Federal, from sea level to 1,800 m. It has also been found in Colombia in the departments of Cesar, Guajira, Magdalena, and Santander from 400 to 1,600 m, and on Curaçao in the Netherlands Antilles at 350 m. The species is ecologically quite variable, occurring in tropical moist, tropical dry, premontane wet, premontane wet (transitional to warm), premontane moist, premontane dry, subtropical dry, and subtropical thorn forest transitional to subtropical dry forest.

Although quite variable in size, *A. crassinervium* can be recognized by its lanceolate, usually acute at the base blades with undulate margins and often with pustular or pale to dark punctations on the abaxial surface, by its lanceolate and sometimes early-deciduous spathe, tapered spadix, and red berries with the seeds attached apically to the carpel wall by a mucilaginous appendage.

Some exceptional collections that should be mentioned are tentatively placed here. Two, *Bunting & Holmquist 4327* and *4328*, from Bolívar State in Venezuela (the only collections known from Bolívar), are quite typical for the species except for the unusually large leaf blade size and the unusually high number of flowers in the primary spiral (11 flowers per spiral). Another collection of note is *Bunting 4397*, from Táchira, with 13 flowers in the primary spiral, and a spathe 5 cm broad. The overall size of the latter plant is reported to be unusually large. Several collections from lower elevations north of the Cordillera de la Costa, especially those from near Cata in Aragua, Venezuela (*Bunting 2197, 2198, 2199, 2200, 4353, 13501, 13508, 13509, 13510, 13511*), are unusual in having the petioles narrowly sulcate and sometimes with the margins convergent adaxially. While this material is interpreted by Bunting (pers. comm.) as *A. ellipticum*, the original description of *A. ellipticum* makes no mention of petiole shape, and subsequent illustrations by Schott (1984) and Engler (Engler's Araceae Illustrations No. 249) show the petiole as shallowly and broadly sulcate with inconspicuous margins adaxially. Petiole shape in *A. crassinervium* is highly variable, and the Aragua specimens exhibit just one of the extremes. Curiously, in his 1905 revision, Engler illustrated *Anthurium ellipticum* (fig. 22) as having a prominently sulcate petiole with the margins curved inward. There is no indication that *A. ellipticum* is out of the range of variation in *A. crassinervium*; however, the illustration of *A. ellipticum* in *Das Pflanzenreich* represents a plant like those mentioned above from near Cata. These may represent a distinct taxon, perhaps a subspecies of *A. crassinervium*. In addition to the petiole cross-section differences, these plants also have longer, more tapered spadices, and are always epilithic or terrestrial (often in sand). This taxon, if recognized, would probably include *A. preussi*, described from a similar area near Puerto Cabello, and perhaps also *A. fontanesii*, but not *A. ellipticum*. Petiole shape in *A. crassinervium* is highly variable, and this represents just one of the extremes.

Anthurium crassinervium is closely related to *A. wagenerianum*, but the latter generally has a short, stout spadix and a short, broadly lanceolate spathe. Its leaf blade margins are minutely undulate in dried specimens, instead of wavy, and are apically cuspidate, instead of acute. Furthermore, the lower leaf epidermis in dried specimens of *A. wagenerianum* is not highly light-reflective at low magnifications, and the concentric epidermal cell pattern observed in *A. crassinervium* is not apparent. The fruits of *A. wagenerianum* are distinctive as well. See that species for further details. Engler distributed several specimens that he determined as *A. wagenerianum*, but which have a markedly tapered spadix like that of *A. crassinervium* and therefore have been included there.

The range of *A. crassinervium* overlaps that of another species which possibly could be confused with it, namely *A. fendleri*, but the latter can be distinguished by its usually thinner blades that are usually narrowly rounded to subcordate at the base, and by its thin, caducous spathe.

Anthurium bonplandii subsp. *guayanum* might also be confused with *A. crassinervium*, as both have similarly shaped leaves that are pustular or punctate abaxially. The petiole of the former is C- or D-shaped and rounded abaxially, while the latter usually has quadrangular petioles which are usually ribbed abaxially. The berries of *A. bonplandii* subsp. *guayanum* are rather dry upon rehydration, and its seeds are attached by a band of fibers. *Anthurium crassinervium*, in contrast, has the more typical seed for sect. *Pachyneurium*, attached to the berry by a mucilaginous appendage.

Pothos crassinervia Jacq. was depicted in Curtis's Botanical Magazine (t. 2987) by J. D. Hooker in 1830 and was said to have come from Demerara (Guyana); however, this was a living collection sent by James Fraser, Esq., and was possibly not locally collected. To date there are no indications the species occurs in the Guianas.

Lectotypification has been necessary in the cases of *A. crassinervium*, *A. ellipticum*, *A. rugosum*, *A. egregium*, and *A. fontanesii*. In the first case, Jacquin clearly described his new species, *Pothos crassinervia*, in 1790, while his illustration, here lectotypified, was not published until 1793. In the second case, Koch mentioned no specimen in his original description of *A. ellipticum*, but did say that it occurred outside of Caracas, and that it was "brought to Europe by the famous Moritzi from Caracasan regions" (translated from Latin by Dan Nicolson, pers. comm.). It is unclear whether he was referring to a Moritzi collection, but it is likely that he had seen the May 1852 Gollmer collection that is here lectotypified, perhaps after its having been brought to his attention by Moritzi. In the third case, Schott described *A. rugosum* in 1858, citing no specimen. However, in 1860, in his *Prodromus*, he mentioned both a Gollmer and a Wagener collection; the Gollmer collection has here been accepted as the lectotype. In the fourth case Schott described *A. egregium* in 1860, again citing no specimen. His plate of drawing 482 deposited at W and represented by microfiche number 13A-7 in his *Icones Aroideae et Reliquiae*, serves as the lectotype of this species. Lastly, Schott cited no specimens in his original description of *A. fontanesii*, citing only that it was cultivated at Schönbrun. His illustration 496 serves as the type.

NETHERLANDS ANTILLES. CURAÇAO: 350 m, *Wilde 6A* (WAG). COLOMBIA. CÉSAR: Sierra Nevada de Santa Marta, SE slopes, Donahui, along trail to Chimencumena, 1,300 m, *Plowman & Davis 3699* (COL, GH); road from La Paz to Manaure, 460 m, *Cuadros & Gentry 3468* (MO), *3465* (MO), Guajira, Serranía La Macuira, SE edge of Cerro Huararech region, 550 m, *Sugden 63* (K); Cerro Manzano, 500–760 m, *Saravia 2424* (COL, US); Guasaira, 600–750 m, *Saravia & Saravia 3561* (COL, US); Palua, 650 m, *Sugden 216* (COL, FHO, K). MAGDALENA: Sierra de Pireja, E of Manaure, Hacienda Nuevo Horizonte, El Podrido, 1,550–1,600 m, *Cuatrecasas & Romero C. 25375* (US); Mpo. Santa Marta, Constante–Pueblito, 100–400 m, *Romero C. 8023* (COL). SANTANDER: Río Lebrija, NW of Bucaramanga, 400–700 m, *Killip & Smith 16298* (US). VENEZUELA. Cult. Berlin, *Engler 193* (GH). ARAGUA: vic. Cata, *Bunting 4493* (MO); 50 m, *Bunting 4355* (NY); Ocumare de la Costa–Cata, above Playa de Cata, *Bunting 2197* (MY), *2198* (NY), *2199*, *2200* (MY); Dtto. Girardot, Cata–Catica, 10–100 m, *Badillo 4904* (MY); Henri Pittier National Park, < 50 m, *Carnevali et al. 2329* (VEN); Ocumare–Turiamo, *Bunting & Holmquist 1978*, *1979* (NY); Maracay–Ocumare, 0.5–2 km NW of Rancho Grande, hillsides of Cordillera de la Costa, 1,200 m, *Bunting 2015* (NY); near Rancho Grande, 1,200 m, *Bunting 1966* (NY); Cerro La Mesa, 1,500–1,900 m, *Bunting 4721* (NY); La Cumbre de Rancho Grande trail, 1,200–1,300 m, 10°21'N, 67°39'W, *Bunting 3266* (MY), *Davidse et al. 16732* (VEN); Cata–Cuyagua, 8–9 km E of Cata, 400 m, 10°29'N, 68°42'W, *Bunting et al. 13501, 13508, 13509, 13510, 13511* (MO); Colonia Tovar–El Limón, *Bunting 2146* (NY). BOLÍVAR: Altiplanicie de Nuria, 500 m, *Bunting & Holmquist 4327*, *4328* (MY). CARABOBO: Puerto Cabello, *Preuss 1552* (B, BM), *Bunting 4353* (NY); Quizandal, *Trujillo 9581* (MY). DISTRITO FEDERAL: Caracas Higuerote, *Bunting 3275* (NY); Caracas–La Guaira, *Rose & Rose 21753* (US); 25 km E of La Guaira by air, 4 km E of Naiguatá on road to Los Caracas, 0–60 m, 10°38'N, 66°42'W, *Liesner & Steyermark 12324* (MO), *Bunting 2144-1* (MO); 2 km E of Los Caracas, *Bunting & Steyermark 2144-2*, *2144-3* (NY); Maiquetia, 40 m, *Andre 289* (K); Silla de Caracas, 1,300 m, *Elias 475* (F); Caracas Botanical Garden, 870–980 m, *Berry s.n.* (MO), *Braun 9* (VEN), *Croat 38338* (MO, PMA, SEL, US), *54412*, *54415* (MO), *54416* (CM, MO), *54418* (CM, F, MO); Cerro El Avila, Quebrada Chacaito, 1,600 m, *Manara s.n.* (VEN); Río Macarao, *Montes 74*, *279* (VEN); Río San Julian, just above Carrabelleda, 10–300 m, *Bunting 2050* (NY), *2050 N*, *2050 J* (NY). FALCÓN: Cerro Socopo, 1,200–1,560 m, 10°29'N, 70°48'W, *Liesner et al. 8356*, *8386* (MO, VEN); Parque Nacional Quebrada de la Cueva El Toro, trail to La Piedra, 600–900 m, 10°50'N, 69°7'W, *Liesner et al. 7864* (MO, VEN); Sierra de San Luís, Curimagua–San Luís, 1,300–1,400 m, *Steyermark 99149* (NY, US, VEN); Sierra de San Luís, Coro–Churumagua, 450 m, *Bunting 2844*, *2846* (NY); Dtto. Bolívar, El Puente, 340 m, *Ruiz et al. 481* (VEN); Dtto. Silva, Cerro Chichiriviche, above Soledad, 200 m, 10°51'N, 68°20'W, *Steyermark & Manara 110812* (MO, VEN); Dtto. Zamora, Cerro Mampostal, 400 m, 11°27'N, 69°17'W, *González 1068* (MO, VEN). LARA: Sanare–Yacambú, road through Parque Nacional Yacambú, 7.6 km past entrance, 1,500 m, 9°42'N, 69°36'W, *Croat 54698* (MO); Humocaro Alto–La Palma, 1.5 km S of La Mesa, 1,280 m, 9°35'N, 70°01'W, *Croat 60621* (CM, K, MO, RSA); Dtto. Jiménez, Alto del Viento–Cerro Pando, 1,000–1,700 m, 9°39–42'N, 69°34–36'W, *Davidse & González 21186* (MO); dirt road 17 km E of Duaca, 1,200 m, 10°17'N, 69°02'W, *Croat 60617* (AAU, MO, VEN); Dtto, Torres, Lara–Zulia, Agua Linda, ca. 35 km E of El Venado, 1,300 m, *Bunting & Fucci*

13475 (NY); 1,100–1,200 m, *Bunting & Stoddart 9753* (NY). MÉRIDA: Mérida–La Azulita, La Chorrera (waterfalls N of hwy.), between Las Cruces and La Calera, 8°35′N, 71°16′W, *Croat 54794* (MO); 28 km W of Mérida–El Vigia intersection, 1,120 m, *Bunting 2602, 2602J* (MY, NY); 9 km above Plaza Bolívar in La Azulita, SE of La Azulita, 1,590 m, 8°44′N, 71°26′W, *Croat 54856* (MO); Mérida–Lagunilla, ca. 2 km S of Mérida, near intersection with road to La Azulita, *Bunting 2740* (MY, NY); Mérida–El Vigia, 26 km above El Vigia, 850 m, *Bunting 2309B* (MY, NY); Caño Zancudo–La Azulita, border of Caño Blanco (Puente Hierro), *Bunting 4382* (MY); 6 km above Caño Zancudo, near bridge across Caño Ron (second bridge), *Bunting 2798* (MY); El Vigia–Tovar, Km 5, 3 km S of junction to Mesa Bolívar, 5 km N of Santa Cruz de Mora, 450 m, 8°26′N, 71°44′W, *Croat 54877* (B, MO); 5 km N of El Morro, 1,800 m, 8°25′N, 71°10′W, *Hahn & Grifo 3320* (MO); Montaña Salinas, Mesa Bolívar, 1,300–1,400 m, *Bernardi 633* (NY); Tovar de Mérida–Panamerican Hwy., 2 km above Zea, 975 m, *Bunting 2574* (NY). MIRANDA: Los Caracas–Higuerote, 1 km E of Osma, *Bunting 3298* (CM, MO, NY); Morros de la Guairita, 880–1,000 m, *Berry 1829, 1897* (VEN); Quebrada Garita headwaters, N of Mérida, Vista Linda, 1,000 m, 10°26′N, 66°49′W, *Steyermark & Berry 111961* (VEN). PORTUGUESA: 15 km E of Chabasquen, 67 km NNW of Guanare, 1,450–1,520 m, 9°26′N, 69°54′W, *Steyermark et al. 126795* (MO). TÁCHIRA: Lobatera–Urena, 13 km NE of Lobatera, near La Victoria, 3,650–3,750 ft., *Bunting 2352* (MY, NY); 1,216–1,250 m, *Bunting 2351, 2351 J* (MY, NY); Rubio–San Antonio, 11 km W of Rubio, *Bunting 11665* (NY); Rubio–Las Delicias, 2 km above Matamulas, 14 km N of Las Delicias, *Bunting 4397* (MY); 6 km above Las Delicias, 5,500 m, *Bunting 2313B* (MY), *Bunting 2313A* (NY); San Cristóbal–Santo Domingo del Táchira, Agua Dulce, *Bunting 2372* (MY); 10 km E of La Fundación, Represa Dorada, 600–1,000 m, *Liesner & González 10189, 10329* (VEN); 35 km SSE of San Cristóbal, La Buenana, 6–12 km W of Quebrada Colorado, 600–1,200 m, 7°28′N, 72°09′W, *Liesner & González 10865* (VEN); Pregonero–La Fundación, 19 km S of Pregonero, 1,200 m, 7°57′N, 71°45′W, *Croat 54948* (MO); San Cristóbal–Delicias, 45 km SW of San Cristóbal, 19 km N of Delicias, 1,300 m, 9°42′N, 72°25′W, *Croat 55031* (MO); San Cristóbal–Chorro del Indio–Caño Seco–La Florida, 1,100–1,200 m, *Bunting 11645* (NY); 1,100 m, *Bunting 13403* (NY); San Cristóbal–Cordero, San Rafael–Cordero, 900–1,000 m, *Bunting 4814* (NY); Maracay–Choroní, 19 km from Maracay, along S slope of northern cordillera, 1,280–1,300 m, 10°18′N, 67°24′W, *Croat 54499* (CAS, F, MO); La Fria, at Las Pavas, along Caño Aguas Calientes, 125–200 m, *Bunting 13390* (NY); La Grita–Pueblo Hondo, ca. 7–8 km N of La Grita, 1,600–1,700 m, *Bunting 11668* (NY); Dtto. Ayacucho, *Bunting & Chacón 4983* (MO, NY); Dtto. Junin, Villa Paez–Betania, 2,050–2,350 m, *Bunting 4958* (NY); Dtto. Cárdenas, above Palmira, 1,800 m, *Bunting 4847* (MO); Dtto. Cárdenas, on the outskirts of Cordero, 1140 m, *Bunting 4864* (NY); above Palmira on the outskirts of San Cristóbal, 1,800 m, *Bunting 13451, 13452* (NY); Dtto. Lobatera, La Cazadora, 1,600 m, 7°55′N, 72°18′W, *van der Werff & Ortiz 5614* (MO); 2,000 m, *van der Werff & Ortiz 5450* (MO). TRUJILLO: Agua Viva–Carora, 20 km NE of Agua Viva, E of Valerita, 150 m, *Bunting 2822* (MY). YARACUY: on road to Candelaria, 7.5–8 km N of Salom, NE of Nirgua, W of Valencia, 1,200 m, 10°11′N, 68°30′W, *Croat 54652* (MO, RSA); Cerro La Chapa, N of Nirgua, 1,200–1,360 m, *Steyermark & Bunting 97722* (VEN); on the outskirts of Aracal, ca. 7 km NW of San Felipe, 600–800 m, *Bunting 2003 S* (NY). ZULIA: Perijá, 1,175 m, *Gines 1926* (US); Serraniá de Perijá, Río Omira-kuna (Tumuriasa), near Colombian border, SE of Pishikakao and Iria, 1,470–1,560 m, *Steyermark et al. 91156* (MO, VEN); Hacienda Los Chorros, 600 m, *Ferrari & Trujillo 1535* (MY); Dtto. Mara, Puesto "El Bosque" de la Guardia Nacional, 1,450–1,600 m, 10°47′N, 72°40′W, *Bunting et al. 12068* (MO), *12227* (MO, NY); Dtto. Mara, river basin of Río Guasare, outskirts of Destacamento Guasare, 600–700 m, *Bunting et al. 12810* (NY); Cumbre de Rancho Grande trail, 1,200–1,300 m, 10°21′N, 67°39′W, *Bunting 3266* (MY).

Anthurium crenatum (L.) Kunth, Enum. Pl. 3: 75. 1841. *Pothos crenata* L., Sp. Pl. ed. 2: 1373. 1763. TYPE: Virgin Islands: St. Thomas, C. Plumier illustration published by J. Burman, Plant. Amer. Fasc. t. 39. 1756 serves as the type. Figures 106, 111, 115.

Anthurium acaule var. *portoricensis* Kuntze, O. Ktze. Rev. Gen. 2:738. 1891. TYPE: Puerto Rico, *Kuntze s.n.* (holotype, MO; isotype, K).

Anthurium acaule var. *brevipes* Engl., Bot. Jahrb. Syst. 25: 362. 1898. TYPE: Puerto Rico, *Sintenis 1582* (holotype, B; isotype, K).

Epiphytic or epilithic, sometimes forming dense clumps; stem to 9 cm long; roots moderately dense, spreading to descending, pale green pubescent, elongate, blunt, 3–4 mm diam.; cataphylls subcoriaceous, narrowly lanceolate, weakly 1-ribbed near apex, 9.5–13 cm long, narrowly acute at apex with a subapical apiculum, light green, drying reddish brown (B & K yellow 5/2.5), persisting semi-intact, eventually deciduous. *Leaves* erect to spreading; petioles 2.5–29.5 cm long, 4–17 mm diam., sharply to bluntly D-shaped, shallowly and broadly sulcate adaxially, the margins sharp but not raised, rounded to 3-ribbed abaxially, the surface weakly pale-speckled; geniculum slightly thicker and paler than petiole, 0.6–1.3 cm long; blades moderately coriaceous, broadly to narrowly oblanceolate or elliptic, sometimes ± oblong, acute to acuminate at apex (the acumen apiculate), acute (rarely weakly subcordate) at base, (18)23–100 cm long, 4–28 cm wide broadest near or above the middle, the margins sinuate to undulate; upper surface semiglossy, medium to dark green, lower surface weakly glossy to semiglossy, paler; midrib acutely angled at base, gradually becoming weakly sunken near the apex above, prominently higher than broad at base, becoming prominently convex toward the apex below, paler than surface; primary lateral veins 8–18 per side, departing midrib at

(30)40–75° angle, ± straight to arcuate-ascending to the margin, raised above, convexly raised below; tertiary veins weakly raised above and below, darker than surface, drying prominently raised; reticulate veins weakly visible above, prominulous and slightly darker than surface below, conspicuously raised when dried; collective vein arising in the upper ⅓ of the blade or absent, 5–12 mm from margin. *Inflorescences* erect to spreading or pendent; peduncle 19–72 cm long, 3–7 mm diam., 1.6–14.4× as long as petiole, green, terete to ellipsoid in cross section; spathe erect to spreading, subcoriaceous, sometimes flushed pink or maroon, usually light green (B & K yellow-green 7/10), linear-oblong, with the margins curled under, 4–14.5 cm long, 0.4–1.5 cm wide, acuminate at apex, obtuse to rounded at base; spadix reddish or purplish violet to maroon (dull, dark bluish purple fide S. Mayo, 1982), long-tapered, somewhat curved, 6.5–25 cm long, 3–8 mm diam. near base, 2.5–4 mm diam. near apex, broadest at the base; flowers scented like rotting fruit prior to anthesis, rhombic to square, 1.5–3 mm long, 1.6–2.2 mm wide, the sides prominently and smoothly sigmoid; 5–8 flowers visible in principal spiral, 8–12 in alternate spiral; tepals matte to weakly glossy, densely, minutely papillate; lateral tepals 0.6–1.4 mm wide, the inner margins straight to rounded, the outer margins 2-sided; pistils emergent 2–3.5 mm, glossy, green; stigma linear, 0.2–0.4 mm long, brushlike; stamens emerging in a slow, regular sequence from the base, the laterals preceding the alternates by 10 spirals; filaments translucent, broader than anthers, ca. 0.5 mm long; anthers 0.3–0.6 mm long, 0.5–0.8 mm wide; thecae oblong-ellipsoid to oblong-ovoid, weakly divaricate; pollen yellow-orange, fading to white (B & K yellow 8/5). *Infructescence* spreading-pendent; spathe withered, usually deciduous; spadix to 2.5 cm diam.; berries bright red (B & K red 4/5), obovoid, glossy, 8–10 mm long, 5–6 mm diam.; mesocarp mealy, white, sweet, becoming acrid; seeds tan to pale yellow, oblong-elliptic, 3.8–6 mm long, 2–2.8 mm wide, 1.5–1.8 mm thick, with a short gelatinous appendage at apex.

Anthurium crenatum is endemic to the northwestern part of the West Indies, where it is known from the Dominican Republic, Puerto Rico, and the small islands to the east of Puerto Rico, namely Vieques, Culebra, St. Thomas, St. John, Tortola, and St. Croix (all but Vieques are part of the U.S. Virgin Islands). It occurs principally in humid forests from near sea level to 900 m. "Dry evergreen woodland" is noted for *Mori & Woodbury 16999*, from St. John.

This species is characterized by its usually narrowly oblanceolate, short-petiolate blades which have conspicuously raised tertiary and reticulate venation on drying and sometimes even on live plants, and by its long-pedunculate inflorescence, which is usually pendent, with a long-tapered, dark purplish violet to maroon spadix and a promptly withering, linear-oblong spathe.

Anthurium crenatum is not easily confused with any other species and is the only member of sect. *Pachyneurium* in the areas where it occurs. It is perhaps most closely allied to *A. crassinervium* of northern South America and Curaçao.

Anthurium crenatum has been confused since Schott's time with *A. acaule* (Jacq.) Schott. See the discussion of the history of this taxonomic confusion by Mayo (1982), whose paper dealing with the West Indian bird's nest *Anthurium* species demonstrates that *A. acaule* is actually a completely different species endemic to Martinique and is probably a member of sect. *Urospadix*, with most of its relatives in Brazil. Howard (1979) erroneously associates the name *A. acaule* with *A. hookeri*.

BRITISH VIRGIN ISLANDS. TORTOLA. Dotys, *Fishlock 368* (GH, K); High Bush, 375 m, *Britton & Shafer 811* (NY, US). DOMINICAN REPUBLIC. Parque Nacional Los Haitises, Monte Plata, 250 m, *Garcia et al. 664* (NY); Liali, 100–500 m, *Abbott 2601* (US); Miches–El Seibo, at crest of Cordillera Oriental, 600 m, *Gastony et al. 694* (GH, NY, US); Río Comatillo, Bayaguana, 150 m, *Liogier 22465* (JBSD); Río San Juan, *Miller 1125* (US); Sabana del Mar, 100 m, *Liogier 18507* (NY, US). LA ALTAGRACIA: 21 km W of hwy., 200–350 m, *Pimentel 83* (JBSD, NY); "El Caracol" (where old road parallels Río Dueye), N of Boca de Yuma, 18°24′N, 68°37′W, *Zanoni et al. 10685* (JBSD); La Colorada, near headwaters of Río Llano, Km 22 on road from Santana to La Colorada, NW of hwy., 18°46′N, 68°44′W, *Mejia & Ramirez 11133* (JBSD, MO, USD); Hato de Mana, Dueye, Río Dueye, 10 km N of Hato de Mana, trail toward Las Auyamas, 18°45′N, 68°50′W, 100 m, *Mejia & Ramirez 11229* (JBSD); 21 km W of Higuey, road to El Seibo, Loma del Penon, 200–350 m, *Zanoni & Mejia 17332* (JBSD); 0.5 km from Otrabanda on road from Cruce de Los Islenos and Nisbon at Arroyo Yaoya, 18°39′N, 69°39′W, *Zanoni et al. 18967XX* (JBSD). SAMANÁ: 9 km NE of Samaná, rd. to La Laguna, and Loma Pan de Azucar, 50 m, 19°15′N, 69°16′W, *Gentry & Zanoni 50600* (MO); Loma Pan de Azucar, E of La Laguna, NE of Santa Barbara de Samaná, 19°15.5′N, 69°18′W, 100 m, *Zanoni & Gentry 34116* (JBSD); Peninsula de Samaná, Loma El Fronton, 19°17′N, 69°10′W, 100–256 m, *Zanoni et al. 29346* (JBSD, MO, NY, USD); Sanchez, *Rose et al. 4396* (NY, US), *Wright et al. 536* (GH, US); Las Canitas Mts., 330 m, *Taylor 7* (GH, US); 3.5 km E of Las Terrenas, 5 km S of Callejon, 19°18′N, 69°30′W, *Zanoni & Mejia 17634* (JBSD). SAN CRISTÓBAL: 8.5 km from Comatillo on road to Cruce de Pilancon and Pilancon, 18°52′N, 69°37′W, *Zanoni & Mejia 16411* (JBSD); Río Capita (de Trinidad), 15 km from Comatillo on road to Sierra de Agua and Trinidad Mejia, 18°50′N, 69°34′W, *Zanoni & Mejia 16318* (JBSD, MO, USD). SIEBO: Cordillera Oriental, along rock road

9.2 km SE of Miches, along Río Yeguada Arroyo Santiago, 100 m, 18°55′N, 69°9′W, *Croat 68550* (MO); Arroyo Las Cabirmas, 5 km S of Miches–Nisibon Hwy., on road to Las Cabirmas, 18°55′N, 69°01′W, 100 m, *Zanoni et al. 15946* (JBSD); El Salado–Otrabanda, Higuey, *Ekman 12243* (GH, K, US); Hato Mayor del Rey, 400–500 m, *Allard 13632* (US); Hato Mayor–Sabana del Mar, Guamira, *Jimenez et al. 4129* (NY); Hato Mayor del Rey, 18°49.5′N, 69°19′W, *Zanoni et al. 11966X* (JBSD); Higuey, *Howard & Howard 9790* (BM, GH, NY, US); 11.7 km W of El Valle, trail to Trepadora Alta, 18°58′N, 69°28′W, *Zanoni et al. 21283* (JBSD). HAWAII. Oahu, cultivated at Foster Gardens, Wahiawa, *Croat 45013* (MO), *45016* (B, MO). PUERTO RICO. Adjuntas, Las Cruces, *Sintenis 4205* (MO, NY, P); Arecibo–Utuado, *Britton & Cowell 345* (NY, US), *Eggers 1142* (P), *Underwood & Griggs 846* (NY, US); Bayamon, *Arsene et al. s.n.* (B, NY), *Stevenson 384* (US), *Underwood & Griggs 908* (NY, US); Bayamon, Finca Sánchez, *Hioram s.n.* (NY, P); Finca Nevares, 50 m, *Acevedo & Chinea 2143* (NY); Hato Tejas, 50–100 m, *Webster & Miller 8607* (US); Candelaria, *Goll et al. 279* (NY, US); W of Candelaria, Km 21.5 on Route 2, 80 m, 18°24′N, 66°14′W, *Solomon 5762* (MO, SEL); Cayey–Guayama, *Underwood & Griggs 336* (NY, US); Coamo Springs, *Britton et al. 5971* (NY); Coco Beach, 18°22′N, 65°48′W, *Boom 8013* (NY); Guayama Road, Quebrada Arriba, *Goll et al. 632* (US); Juana Díaz, Peñas de las Cuevas, *Britton & Marble 2296* (NY, US); Laguna Tortuguero, *Wagner 286* (U); 2 mi. N of Mameyes, 50 m, *Hartley 13373* (U, US); Maricao, *Sintenis 479* (BM, GH, K, US); Mayagüez, *Heller 6283* (E, GH, MO, NY, P, US); Morovis, 300 m, *Liogier 30065* (MO); Palmer–Florida Road, *Wagner 203* (GH); San Juan, *Hioram* (Rose) 7 (11.298) (NY, US), *Hornbeck s.n.* (W), *Krebs s.n.* (C, W), *Kuntze s.n.* (K, NY), *Riedel s.n.* (P); San Narciso, *Britton & Britton 7270* (NY); Santurce, *Heller & Heller 1267* (NY, US); Utuado, *Britton 5224* (NY); Yauco, *Garber 104* (GH, K, NY); Dorado Beach Forest, Dorado, Dorado Beach Hotel, 10 m, *Croat 60851* (B, CM, MO, RSA); El Dorado forest, N coast, 18°28′N, 60°16′W, *Luteyn & Luteyn 11466* (NY); Río Abajo State Forest, Hwy. 621, near end of asphalt road, 360–390 m, 18°19′N, 66°40′W, *Croat 60860* (MO, US); Río Piedras, *Johnston 151*, *901* (NY); Sierra de Luquillo, Mt. Jimenes, *Sintenis 1582* (K); Sierra de Naguabo, 210–675 m, *Shafer 3392* (NY). CULEBRA: *Britton & Wheeler 114* (NY, US). MANATÍ: 2 mi. NE of Manatí, *Hansen et al. 9068* (MO, USF). VIEQUES: *Eggers s.n.* (GH), *Grosgourdy 13* (P); Isabel Segunda–Capo Cielo, *Shafer 2377* (NY, US). U.S. VIRGIN ISLANDS ST. JOHN: Bethania–Rosenberg, *Britton & Shafer 225* (NY, US); Bordeaux, 330 m, *Britton & Shafer 545* (NY, US). ST. THOMAS: Bourne Resolution, *Britton & Marble 428* (NY); above Cinnamon Bay, road to Herman Farm, 60–120 m, *Mori & Woodbury 16999* (MO); Pearl–Bourne Resolution, *Britton & Marble 1320* (NY, US), *Eggers 307* (GH, NY), *Friedrichsthal s.n.* (K, W), *Krebs s.n.* (K, W), *s.n.* (NY), *Raunkiaer s.n.* (P, US), *Richard s.n.* (P); Signal Hill, 500 m, *Eggers 308* (K, P), *475* (US), *814* (P), *Eggers s.n.* (Engl. Arac. no. 191) (GH, K, P, US).

Anthurium cubense Engl., Bot. Jahrb. Syst. 25: 364. 1898. TYPE: Cuba. Monte Toro, 300 m, *Eggers 5402* (holotype, B; isotype, K). Figures 1, 112, 113, 116, 117.

Epiphytic or terrestrial; stem short, to 3 cm diam.; roots dense, ascending, green when young, becoming gray, pubescent at base, becoming smooth, tapered or ending abruptly, ca. 5–10 cm long, 3–5(8) mm diam.; cataphylls subcoriaceous, lanceolate, (4)10–22 cm long, narrowly acuminate at apex, drying reddish brown (B & K yellow-red 4/10), persisting ± intact, weathering into coarse linear fibers and persisting around stem. *Leaves* erect; petioles (4)6–16(36) cm long, (2)5–12 mm diam., C-shaped to D-shaped, broadly sulcate adaxially, rounded to obscurely flattened abaxially; geniculum slightly thicker than petiole, 0.5–1.5 cm long; sheath (1)3–8 cm long; blades subcoriaceous, usually oblanceolate-elliptic, sometimes ± elliptic, short to long-acuminate at apex, usually obtuse at base, sometimes acute or weakly rounded, (20)33–95 cm long, (5.5)13–38 cm wide, broadest at or near the middle, the margins conspicuously undulate; upper surface semiglossy, medium green (B & K green 5/2.5), lower surface matte, slightly paler, both drying grayish; midrib flat to convexly raised at base, becoming obtusely raised toward the apex above, broadly angular to 3-ribbed below; primary lateral veins 6–11 per side, departing midrib at 30–50° angle, ± straight to the margin, convexly raised above and below, slightly paler than surface; tertiary veins obscure, weakly raised to prominulous when dried; reticulate veins visible, darker than surface, obscure when dried; collective vein arising in the upper ⅓ to upper ¼ of the blade or absent, equally as prominent as primary lateral veins when present. *Inflorescences* erect, rarely spreading, usually several at different stages of development per plant; peduncle (5.5)8–33 cm long, (2)5–10 mm diam., 0.4–1.2× as long as petiole, green tinged violet, terete; spathe reflexed at anthesis, rarely recurled, subcoriaceous, green tinged with violet-purple, ovate to lanceolate, (2.5)5–16 cm long, (0.6)1–5 cm wide, broadest near the base, acute to acuminate at apex, rounded at base; stipe to 2 cm long in front, to 1 cm long in back; spadix purplish (B & K purple 4/5) to pale violet-purple (B & K purple 6/7.5), cylindroid, slightly tapered toward both ends, (2.5)8–19 cm long, (4)6–10 mm diam. near base, (3)5–9 mm diam. near apex; flowers rhombic to 4-lobed, (1.3)2.1–2.6 mm long, (1.7)2–2.6 mm wide, the sides weakly sigmoid, sometimes straight; 9–12 flowers visible in principal spiral, (9)14–16 in alternate spiral; tepals matte, pale punctate, slightly roughened; lateral tepals 0.7–1.4 mm wide, the inner margins straight to weakly convex, the outer margins 2-sided; pistils weakly raised, greenish, darker than tepals; stigma linear, 0.4 mm long; stamens emerging in a scattered pattern throughout the spadix, laterals emerging almost to apex before alternate emerge, held just above tepals and against pistil, obscuring the latter at anthesis; anthers white tinged with red-violet; thecae oblong, not divaricate; pollen white. *Infructescence* spreading or erect; spathe persisting, brown; spadix ca. 14–27 cm long, 2–2.5 cm diam. (not including exserted berries), with the berries scattered throughout; berries orange-red (B & K yellow-red 5/2.5), ellipsoid, subtruncate and subapiculate at apex, 9–14 mm long, 4.5–6 mm diam.; mesocarp juicy; usually 1, sometimes 2 seeds per berry, yellow (B & K yellow 9/5), oblong to ellipsoid, 5–7 mm long, 3–3.4 mm diam., with a gelatinous, sticky, transparent appendage.

Anthurium cubense is found in Cuba and drier parts of eastern Guatemala and Yucatan on the Atlantic slope, and in Nicaragua, Costa Rica, and Panama on the Pacific slope. In South America, it extends along the Caribbean coast from western Venezuela to Colombia, with one outlying collection known from the Río Patia in southern Colombia. It occurs in tropical dry forest, drier parts of tropical moist forest, and premontane wet forest from sea level to 700 m. It is most common in Cuba and Nicaragua.

This species is recognized by its short petioles, short inflorescences (much shorter than the leaves), its stubby, purplish to pale violet-purple spadix that is tapered toward the apex (or sometimes toward both ends), and by its bright red berries. It has no apparent close relatives and is not easily confused with any other species.

Engler (1905) also recognized material of this species under the name *Anthurium recusatum* Schott from Cuba. That name, however, has been misapplied and is probably synonymous with *A. fendleri* from South America. *Anthurium fendleri* is not closely related to *A. cubense*, though it has a similar rosulate habit. It differs chiefly in having a long-pedunculate inflorescence, narrowly tapered spadix, promptly withering spathe, and purple berries.

COLOMBIA. Isla de Providencia, Smooth Water Road, *Torres-Romero 295* (COL). ATLÁNTICO: Barranquilla, *Elis 1295* (F, US), *1404* (F). BOLÍVAR: Turbaco, Torrecilla, *Killip & Smith 14656* (GH, NY, US); Mpo. San Juan Nepomuceno, Santuario Nacional de los Colorados, 230–250 m, 9°58′N, 75°10′W, *Cuadros & Keating 60679* (MO). MAGDALENA: Dibulla, *Seifriz 263* (US); Santa Marta, *Smith 2763* (GH, K, NY); Quebrada El Cedro, 350–400 m, *Moreno 415* (COL). COSTA RICA. GUANACASTE: 5 km S of Peñas Blancas, 15 km N of La Cruz, 1.5 km E of main road, 0–300 m, 11°11′N, 85°37′W, *Liesner 4652* (MO). PUNTARENAS: Cabo Blanco Nature Reserve, *Burger & Liesner 6627* (F, MO). CUBA: without locality, *Sagra s.n.* (P); Finca Olimpo, *Hioram 3937* (US); Managua, *Baker 316* (NY, US); Matanzas, *Meisner s.n.* (NY); Monte Toro, 400 m, *Eggers 5402* (B, K), *Wright 3208* (BM, GH, K); Orientali, *Wright 601* (GH, K); San Diego de los Baños, *Britton et al. 6854* (NY), *León 4233* (NY, P). LA HABANA: La Guácima, *Abarca & O'Donovan 4688* (GH, NY); San Antonio, *Hitchcock s.n.* (F), *Van Hermann 822* (F, NY); Vento, *Curtiss 647* (BM, F, GH, K, MO, NY, P). LAS VILLAS: Hanabanilla Falls, *Britton et al. 4838* (NY); Santa Clara, *Rowe 8643* (GH), 8644 (NY). MATANZAS: Matanzas, *Britton & Shafer 377* (NY). ORIENTE: Bayate, *Ekman 6202* (NY); Firmeza-Gran Piedra, *Shafer 8936* (GH, K, NY); Paso Estancia, *Shafer 1573* (NY); San Luis, *Britton 2324* (NY); Rio Guama, upper part, 300 m, *Taylor 195* (NY). PINAR DEL RÍO: El Guama, *Palmer & Riley 317* (US); Río Mestanza, *Britton et al. 10152* (US, NY); Sierra de Anafe, *Britton et al. 9608* (NY), *Wilson 11492* (NY, US); Sierra Guayaba, *Shafer 13851* (A, NY); Mpo. Vinales, Sierra del Infierno, across Hwy. from Granja "Moncada," 18°14′N, 68°39′W, 150 m, *Proctor et al. 39314* (JBSD); Pasco Real, *Van Hermann 988* (GH). SANTIAGO: El Cobre, *Pollard & Palmer 389* (GH, MO, NY, US, F). GUATEMALA. ALTA VERAPAZ: Cubilgüitz, *Tuerckheim 8606* (US). GUYANA: Demerara, cultivated at Glasgow Bot. Gard., *Hooker s.n.* (K). NICARAGUA. BOACO: Boaquito–Sta. Lucia, 4 km E of Boaca, Hacienda Peñas Blancas, 400–600 m, *Grijaiva & Soza 4197* (MO, SAR). CHONTALES: *Vincelli 86, 87* (MO); Acoyapa–Río Oyate, 0.4 km SE of bridge over Quebrada Niscale, 50 m, 11°47′N, 85°01′W, *Henrich & Stevens 161* (MO); 1.9 km S of La Libertad, 530 m, 12°12′N, 85°10′W, *Stevens & Montiel 17513* (MO); 5.3 km W of Puente Lovago, Km 160.1, 150–170 m, 12°00′N, 85°12′W, *Stevens & Henrich 20524* (MO); 1.5 km E of San Pedro de Lovago, 260–280 m, 12°07′N, 85°07′W, *Moreno 16047* (MO); 2 km S of Acoyapa, *Nichols 1723, 1725* (MO); 2 km N of Santo Tomás, rd. to San Domingo, 340–380 m, 12°04′N, 85°06′W, *Moreno 16208* (MO); 2.8 km N of Cuapa, 400–500 m, 12°17′N, 85°23′W, *Pipoly 1571* (CAS); N of Cuapa, *Stevens 3662, 6107* (MO); Río El Bizcocho, Juigalpa–La Libertad, 17.4 km NE of Río Mayales, 350–400 m, 12°12′N, 85°17′W, *Stevens 4030* (MO); Río Oyate, Acoyapa–Morrito, 50 m, 11°44′N, 84°59′W, *Stevens 21631* (MO). ESTELÍ: Kukamonga, km 167, Belén, 660–800 m, 13°15′N, 86°21′W, *Moreno 21822* (MO). GRANADA: road to Cutirre, 10–13 km NE of Granada, 350–400 m, 11°50′N, 86°56–57′W, *Moreno 1471, 1516* (MO); Granada, 40 m, *Levy 88* (P); Isla Zapatera, NE of Hacienda El Cerro, 400–525 m, 11°40′40″N, 85°45′45″W, *Grijalva 1936* (MO); Isletas de Granada, Isla El Carraco, 35 m, *Martínez & Rivière 1543* (MO, MEX); Volcán Mombacho, *Neill 2730* (cult. at Kew) (B, K, M, MBM, MO, PMA, US); NE side, *Atwood & Neill AN82* (MO); 10 km S of Granada, finca "Las Delicias," 340–360 m, 11°51°N, 85°57′W, *Moreno & Henrich 8447* (MO); Finca Cutirre, 300–400 m, 11°59′N, 85°55′W, *Guzmán & Castro 2152* (MO); S of Hacienda Cutirre, 300–400 m, 11°49′N, 85°55′W, *Moreno 16442* (MO); Las Delicias–Hda. Cutirre, 400–500 m, 11°50′N, 85°56′W, *Moreno 16478* (MO); las Fincas María Auxiliadora–El Cacao, 400–500 m, 11°51′N, 85°56′W, *Moreno 442* (MO). MANAGUA: Managua, *Maxon et al. 7538* (US); Managua, cultivated, *Araquistain 398* (MO); Centro de Managua, cult. in garden at Sears dept. store, 120 m, *Araquistain 40* (L, MO). MASAYA: Volcán Masaya National Park, *Stevens 4444* (B, MO). RÍO SAN JUAN: San

Carlos, *Atwood 2028* (MO); W of San Carlos, 30–35 m, 11°08'N, 84°47'W, *Sandino 1773* (MO). RIVAS: Isla de Ometepe, Volcán Concepción, Altagracia "La Sabana," 200–500 m, 11°32'N, 85°35'W, *Robleto 133* (MO); N side of Volcán Concepción, 300–1,000 m, 11°33'N, 85°37'W, *Moreno 19827* (MO); NE of Volcán Concepción, 140–160 m, 11°33'N, 85°35'W, *Sandino 4240* (MO); Volcán Maderas, Mérida, vic. "Las Abejas," 500–700 m, 11°26'N, 85°32'W, *Robleto 293* (MO); NE side of Volcán Maderas, 600–900 m, 11°27'N, 85°29'W, *Moreno 19580, 19600B* (MO); Volcán Masearas, Santa Cruz, *Stevens 6626* (MO). ZELAYA: Caño Majagua, *Stevens 6894* (MO). PANAMA: CHIRIQUÍ: 1 km E of Remedios, 8°14'N, 81°50'W, *Nee 10104* (MO, PMA); Río Estí, Gualaca–Fortuna, 0.6 km E of Gualaca, 700 m, *Croat 48793* (FTG, MO). VENEZUELA: FALCÓN: Dtto. Silva, Golfete de Guare, "La Penita," S of Chichiriviche, 10–100 m, 10°54'N, 68°16–17'W, *Steyermark & Manara 110434* (MO). ZULIA: Quebrada Perayra, SE of Machiques, *Steyermark 99847* (MY); Serranía de Perijá, Río Palmar, *Chitty & Benkowski 3061* (VEN); SE of Machiques, *Steyermark & Fernandez 99638* (K, MY, NY, US); headwaters of Río Guasare, 280 m, *Gentry 41141* (B, MO); 6 km W of main road and 2 km S of Río Catatumbo, 20–100 m, 9°06'N, 72°142'W, *Liesner & Gonzalez 13274* (MO); Dtto. Colón, Laguna de Congo, *Lescarboura 55* (MY); Dtto. Mara, El Palmar, *Medina 902* (MY); Caño Indio, Hacienda Caño Azul–Base of Cerro Yolanda, *Steyermark et al. 122640* (VEN); Cerro Negro, SE of Río Guasare, *Steyermark et al. 122687, 122690* (MO, VEN); Río Socuy, W of Cerro Caracara, SW of Corpozulia Campamento Socuy, *Steyermark et al. 123115* (VEN); Dtto. Perijá, La Villa de Rosario, foot of Sierra de Perijá (via Arimpia), 20–25 km W of La Villa, 225–350 m, *Bunting et al. 8800* (MO, NY); Quebrada Cosira, SW of Los Angeles de Tucuco, *Davidse et al. 18531* (MO, VEN).

Anthurium curtispadix Croat, sp. nov. TYPE: Ecuador. Pastaza: Puyo; originally collected by Mickey Carmichael, *Croat 55207* (holotype, MO 3104658; isotypes, AAU, B, K, M, NY, RSA, U, US; cult. at MO). Figures 114, 118, 123.

Caulis ad 21 cm longus, 3 cm diam.; cataphyllum persistens semi-intactum; petiolus 3.5–14 cm longus, 4–9 mm diam., D-formatus ad C-formatus, adaxialiter sulcatus; lamina elliptica ad oblanceolata, 17–57 cm longa, 7.5–20 cm lata; nervis primariis lateralis 5–7 utroque. Pedunculus 5–10 cm longus, 4 mm diam., effusus; spatha pallida viridis, oblongo-lanceolata, 3–3.5 cm longa, 1.5–2 cm lata; spadix erectus, cylindricus, 3.5–4.7 cm longus, 6–7 mm diam., pallide viridis. Baccae ignotae.

Stem to 21 cm long, ca. 3 cm diam.; leaf scars conspicuous or obscured by root mass, 0.5–1 cm high, 0.6–0.8 cm wide; roots ascending to spreading to descending, green to light brown (B & K yellow-red 9/7.5), smooth to sometimes weakly pubescent, tapered, elongate, 4–7 mm diam.; cataphylls subcoriaceous, weakly 1-ribbed near the apex, 5–8 cm long, narrowly acute and apiculate at apex, drying tan to reddish brown, persisting semi-intact, eventually as a reticulum of fibers with the apex remaining intact. *Leaves* erect to spreading; petioles 3.5–14 cm long, 4–9 mm diam., D-shaped to C-shaped, slightly sulcate adaxially, with the margins sharply to obtusely raised, rounded to sometimes obscurely 1–2-ribbed abaxially, the surface obscurely short-lineate; geniculum paler and thicker than petiole, becoming minutely and transversely fissured and scurfy abaxially, (0.7)1–2.2 cm long; blades subcoriaceous, elliptic to oblanceolate, gradually acuminate at apex (the acumen apiculate), narrowly acute to obtuse to weakly rounded at base, 17–57 cm long, 7.5–20 cm wide, broadest at or above the middle, the margins weakly undulate; upper surface semiglossy, medium green, lower surface matte to weakly glossy, paler, drying greenish to yellowish green; midrib flat at base with blunt medial rib, narrowing and acute toward the apex above, convexly raised and paler than surface below; primary lateral veins 5–7 per side, departing midrib at 30–45° angle, ± straight, raised and weakly paler than surface above, convex below; interprimary veins absent; tertiary veins obscure above, visible below; reticulate veins obscure above, darker than surface below; collective vein arising from near the apex, weakly sunken above, prominulous below, 2–9 mm from margin. *Inflorescences* spreading, usually several present at once; peduncle 5–10 cm long, 4 mm diam., equaling to usually ca. 0.5× as long as petioles, green (B & K yellow-green 6/7.5), terete; spathe reflexed-spreading, coriaceous, pale green, sometimes weakly tinged with red (B & K yellow-green 8/10), oblong-lanceolate, 3–3.5 cm long, 1.5–2 cm wide, broadest in the lower ⅓, inserted at 75° angle on peduncle, gradually to abruptly acuminate at apex (the acumen inrolled, hooked), acute to decurrent at base, the margins strongly downturned, meeting at 60–80° angle; spadix pale, dull green, somewhat tinged with brown, sessile, cylindroid to sometimes weakly clavate, erect, held at ca. 90° angle from peduncle, 3.5–4.7 cm long, 6–7 mm diam. near base, 3–4 mm diam. near apex, broadest at the base; flowers rhombic to 4-lobed, 1.7–2.3(2.6) mm long, 1.3–2.3 mm wide, the sides straight to jaggedly sigmoid; 13–15 flowers visible in principal spiral, 9 in alternate spiral; tepals matte, minutely papillate; lateral tepals 1.5–1.8 mm wide, the inner margins broadly rounded, the outer margins irregularly 3-sided; pistils weakly emergent, purplish violet; stigma linear, slitlike, 0.3 mm long; stamens emerging in a prompt, erratic sequence, the laterals extending to the apex in a scattered pattern before the 3rd stamen emerges, laterals followed by alternates in a rapid succession but very irregularly on the spadix (sometimes the 4th stamen appearing first); anthers white, 0.6 mm long, 0.7 mm wide, obscuring pistil; thecae ellipsoid, not divaricate; pollen drying white. *Infructescence* not seen.

Anthurium curtispadix is known only from a living collection made near Puyo in Pastaza Department, Ecuador, by Mickey Carmichael. It was probably collected in an area of premontane wet forest at ca. 1,000 m.

This species is distinguished by its short, spreading inflorescence with an erect, short, stubby spadix (hence the name) with many (9–15) flowers per spiral. It is probably most closely related to *A. ernestii*, which differs in having an erect inflorescence and cataphylls persisting as an intact network of fine, pale fibers.

ECUADOR. PASTAZA: Puyo, cult. at MO and originally collected by Mickey Carmichael, ca. 1,000 m, *Croat 55207* (AAU, B, K, M, MO, NY, RSA, U, US).

Anthurium dombeyanum Brongn. ex Schott, Prodr. 477–478. 1860. TYPE: Peru, without exact locality, *Dombey s.n.* (holotype, P). Figures 11, 13, 119–122, 127.

Anthurium cymatophyllum K. Koch & Sello in K. Koch, 1221 xi. 276. 1868. TYPE: destroyed, locality unknown, of cultivated origin said to be from Brazil (a tracing at Kew prepared by Masters from Koch's type specimen in Berlin serves as the type).

Anthurium agoyanense Sodiro, Anales Univ. Centr. Ecuador 19: 286. 1905. TYPE: Ecuador. Tungurahua: Agoyán waterfalls in Río Pastaza, slopes of Volcán Tungurahua, 1,550 m, *Sodiro s.n.* (holotype, B)

Anthurium agoyanense var. *eleutheroneuron* Sodiro, Anales Univ. Centr. Ecuador 19: 287, 1905. TYPE: Ecuador, Tungurahua: slopes of Volcán Tungurahua, vic. Machay, *Sodiro s.n.* (holotype, B).

Anthurium rigidissimum Engl., Pflanzenr. IV. 23B(Heft 21): 292. 1905. TYPE: Peru. Junín: Tarma, above Huacapistana, 1,900–2,000 m, *Weberbauer 2007* (holotype, B).

Anthurium rigidissimum var. *mutatum* Engl., Pflanzenr. IV. 23B(Heft 21); 292. 1905. TYPE: Peru. Junín: Tarma, above Huacapistana, 1,900–2,000 m, *Weberbauer 2158* (holotype, B).

Terrestrial or epilithic, rarely epiphytic; stem 20–30 cm long, 2–6 cm diam.; roots dense (the root mass to 20 cm wide), greenish to pale reddish, grayish when dried, sometimes with raphide cells on the surface, elongate, blunt at apex, to 40 cm long, 4–10 mm diam.; cataphylls subcoriaceous, lanceolate, 5–25 cm long, narrowly rounded to bluntly acute at apex, pale green, drying brown, persisting semi-intact at upper nodes, otherwise as coarse linear fibers, sometimes with the apex remaining intact. *Leaves* erect to spreading; petioles (3)10–30 cm long, 5–18 mm diam., erect to spreading, D-shaped, slightly thicker than broad in juveniles and lacking the medial rib adaxially, sulcate in age with an obtuse to acute medial rib, rounded (rarely 1–2-ribbed) abaxially, the surface pale-speckled; geniculum slightly thicker and paler than petiole, 0.5–2.5 cm long; sheath 3–11 cm long, extending halfway or throughout the petiole in smaller leaves; blades subcoriaceous to thickly coriaceous, oblong-lanceolate to oblanceolate or narrowly obovate, often elliptic in smaller leaves, bluntly acute or acuminate at apex (the acumen minutely apiculate), long-attenuate to obtusely rounded or subcordate at base, (10)40–190 cm long, (2)10–35 cm wide, broadest above or near the middle, the margins flat in smaller leaves or markedly undulate especially in larger leaves; upper surface glossy to semiglossy, dark to medium green, occasionally developing a bluish, glaucous covering with age, lower surface usually semiglossy, rarely matte, concolorous or paler than upper surface; midrib above acutely raised, below obtusely ribbed at base, becoming acutely angled in upper ⅓, and then convexly rounded toward the apex, paler than surface or concolorous with it; basal veins usually present and aggregated in subcordate leaves, arcuate-ascending, free to base; primary lateral veins (7)10–20(24) per side, departing midrib at (18)40–60(70)° angle, usually gently arcuate-ascending to within 1 cm of the margin, then abruptly ascending to the margin, convexly raised above; tertiary veins scarcely visible above, moderately to distinctly visible below, sometimes darker than surface, very weakly raised below or flat, drying raised and conspicuously visible; collective vein arising from near the base to near the apex, less prominent than primary lateral veins, sunken to weakly raised above, raised below, 2–10 mm from margin. *Inflorescences* erect-spreading to spreading-arching, shorter than or almost equaling leaves; peduncle (15)30–65(90) cm long, 2–11 mm diam., (2)3–7(10)× as long as petiole, pale green, sometimes tinged with red-violet, green to dark brown when dried, subterete, sometimes 1-ribbed, flexible; spathe spreading to reflexed at anthesis, recurled, subcoriaceous to coriaceous, green, sometimes tinged with red-violet, speckled with raphide cells, linear-lanceolate, 7–20 cm long, 1–3.5 cm wide, broadest near base, acute at apex, decurrent at base; spadix olive-green to grayish, becoming dark pink or maroon (B & K red-purple 2/2.5) to purplish at anthesis (B & K blue-purple 4/10), weakly to moderately tapered, rarely cylindroid, sessile to stipitate to 2.5 cm, ± erect, rigid, held at 130–180° angle from peduncle, 4–28 cm long, 4–17 mm diam. near base, 3–11 mm diam. near apex, broadest near the base; flowers squarish to 4-lobed, to 3 mm long when fresh, 1.6–2.6 mm long when dried, to 2.5 mm wide when fresh, 1.4–2.2 mm wide when dried, the sides ± straight to smoothly sigmoid; 4–14 flowers visible in principal spiral, 3–8 in alternate spiral; tepals matte; lateral tepals 1–1.6 mm wide, the inner margins tinged with pink, becoming purplish, broadly convex, the outer margins 2–4-sided; pistils scarcely emergent, green, with raphide cells; stigma oblong, slitlike, 0.4–0.6(1.0) mm long; stamens emerging irregularly from the base of the spadix in a scattered pattern, slightly exserted, lateral stamens emerging to midway, the laterals preceding the alternates by 5–18 spirals, inclined over and obscuring pistil; filaments tan, with raphide cells, exserted ca. 0.5 mm, 1–2 mm long, 0.6–0.9 mm wide; anthers pinkish, 0.6–1.1 mm long, 0.5–1 mm wide, inclined over the pistil; thecae obovoid, scarcely or not divaricate; pollen pale orange to pale yellow fading to cream, yeasty scented. *Infructescence* semi-erect; spathe persisting; spadix 5–27 cm long, 1.5–2.5 cm diam., with berries scattered throughout; berries violet-purple to reddish violet (B & K purple 3/10), obovoid, bluntly rounded at apex, 6–8 mm long, 5–6 mm diam.; pericarp with raphide cells; mesocarp pulpy, white; seeds 1–2 per berry, green, oblong, 3.5–8 mm long, 2.5 mm diam., with a gelatinous appendage at apex.

Anthurium dombeyanum is an Andean species ranging from central Ecuador to southern Peru at 950 to 2,760 m. Collections from Ecuador are from the provinces of Tungurahua and Loja (a somewhat aberrant collection is known from Morona–Santiago; see below), while Peruvian collections are represented from Amazonas and Cajamarca to San Martín, Huánuco, Pasco, Junín, and Cuzco. Specimens from Ecuador ostensibly occur in lower montane moist forest to premontane moist forest life zones. In Peru, the species is present in lower montane and montane moist forest and premontane dry forest. The species occurs in seasonally dry habitats and often inhabits rocky or extremely precipitous sites, with low nighttime temperatures.

This species is recognized by its short-petiolate, coriaceous, usually markedly undulate blades, its long-pedunculate inflorescence with a moderately short-tapered, usually purple spadix, thick, green, lanceolate reflexed spathe and minutely papillate tepals with a more or less erose inner margin. Another feature common to most plants, despite their markedly variable blades (ranging from narrowly obovate to oblong-oblanceolate) is the primary lateral veins, which frequently extend nearly to the margin in an almost straight line before turning markedly upward and extending along the margin and gradually merging with it.

The only species which might be confused with *A. dombeyanum* is *A. leonianum*, from northern Ecuador, but only two collections of *A. dombeyanum* are known from anywhere near this area and fall short of reaching the same province (Imbabura). *Anthurium leonianum* is most easily distinguished by its petioles, which are 5–8-ribbed, rather than rounded abaxially. See that species for further discussion.

Anthurium cymatophyllum is doubtfully placed here in synonymy. Typical material is no longer existent, and the species is represented by a tracing of the type done by Masters and deposited at Kew and by a photograph taken before the type was destroyed in World War II. The species was described from a plant of cultivated but unknown origin. There was speculation it originated in Brazil, but it is almost certainly not of Brazilian origin. It most clearly fits into *A. dombeyanum*, although the three-ribbed abaxial petiole surfaces are rare in that species.

The leaf of *Anthurium dombeyanum* demonstrates great morphological plasticity in size and shape. A common feature of many collections is an obtuse to rounded leaf base with an aggregation of many veins in the lower few centimeters of the base. Yet plants in the same population, or even on the same individual, may commonly exhibit acute leaf bases lacking such an aggregation of veins. Comparison of *Croat 58323* and *Croat 58324* demonstrates the range of leaf bases found within a population. Inspection of the various sheets of *Croat 57707* or *Croat 58323* demonstrates this tendency within one individual. The species is also tremendously variable in size, ranging from rather tiny plants collected in exposed areas (e.g., *Vargas 3988*) to huge plants growing in more mesic habitats (e.g., *Croat 58323*).

Several collections are worthy of special mention. Two individual collections, *Croat 58366* and *Ellenberg 3538*, are from unusually low elevations, i.e., 630 m and 370 m, respectively. The Croat collection, from Cajamarca, Peru, is perhaps a distinct species, having blades that dry yellowish green rather than the more typical brown color, and a weakly glaucescent aspect to its mature leaves. The Ellenberg specimen, from Amazonas, Peru, on the road between Bagua and Nazareth, is not unusual in any manner other than its aberrant low elevational occurrence. *Sparre 19272* was also collected at a rather low elevation (700–800 m) and is the only collection known from Morona-Santiago Province in Ecuador; its leaf blade is also unusually broad. *Vargas 6209*, from Cadena in Cuzco, Peru, is aberrant in having the peduncle only ⅔ the length of the petiole (vs. (2)7–10× longer in typical *A. dombeyanum*), although the spadix is rather immature. Two collections from near Quillabamba in Cuzco, Peru (*Croat 50962, 50919*) differ in having the petioles 3-ribbed abaxially, whereas most, if not all, other material has petioles rounded abaxially. *Barbour 2583*, from Amazonas in Peru, is remarkable in having a spathe 4 cm broad near the base and a petiole recorded as terete. The spathe of *Croat 58192*, from San Martín, approaches the dimensions of the Barbour collection.

ECUADOR: LOJA: Cerro Campana, Vilcabamba-Yangana, Km 7, 1,900 m, 79°16'W, 4°17'S, *Lojtnant & Molau 15002* (AAU, GB); Loja-San Lucas, 2,100 m, *Asplund 18056* (S); Km 25–32, 2,200 m, *Dodson & Thien 597* (MO), *659* (MO, US, WIS); 19 km N of Loja, 2,070 m, 4°10'S, 79°10'W, *Croat 50847* (AAU, B, CM, GB, K, M, MBM, MO, QCA, SEL, US); Mollococha, 10 km W of Vilcabamba, 1,600 m, *Harling & Andersson 21769* (GB). MORONA-SANTIAGO: Gualaquiza, Misión Bomboiza, Misión Salesiana, 700–800 m, *Sparre 19272* (S). TUNGURAHUA: *Sodiro s.n.* (B); Agoyan, *Sodiro s.n.* (B; photo, MO). PERU: Without locality, *Dombey s.n.* (P). AMAZONAS: Prov. Bagua, 15.6 km E of main plaza in Bagua, 5 km above La Peca, 1,050–1,160 m, 5°33'S, 78°21'W, *Croat 58358* (MO, USM); 12 km E of La Peca (by trail), 1,700 m, *Barbour 2583* (MO); Bagua Grande, Longa Grande, Buenos Aires (Calpon), 1,420 m, *Diaz & Campos 3427* (MO); Bagua-Nazareth, 370 m, *Ellenberg 3538* (MO); Prov. Bongara, Bongara, 8 km above Pedro Ruiz Gallo (Jazan), road to Pomacochas, 1,500–1,600 m, 5°55'S, 77°53'W, *Knapp & Alcorn 7538* (MO); Río Utcubamba, SE of Naranjitos, *Gentry et al. 61375* (MO); Suyobamba, 3 km NE of Pedro Ruiz Gallo, 1,400 m, 5°55'S, 77°58'W, *Gentry et al. 61290* (MO); Chiclayo-Río Utcubamba, trail above hwy., NW of Pedro Ruiz Gallo, 1,300–1,400 m, *Young & Eisenberg 289* (MO); Moyobamba-Bagua, NW of Pedro Ruiz Gallo, 1,820 m, 5°52'S, 77°56'W, *Croat 58314* (MO); at jct. of road to Chachapoyas, NW of Pedro Ruiz Gallo, 1,440 m, 5°56'S, 77°56'W, *Croat 58321, 58324* (MO, USM, VBD), *58322* (CAS, CM, MO, NY, RSA, USM), *58323* (K, MO, RSA, SEL, US, USM); Lago Pomacocha, Moyobamba-Chachapoyas, Km 339–340, Pomacocha, 2,200–2,250 m, 5°47'S, 77°53–54'W, *Croat 58254* (MO, NY, USM), *58281* (MO); Prov. Chachapoyas, Hacienda Shani, Chachapoyas, *Cevasco s.n.* (USM). AYACUCHO: Valle de San Miguel, Media Naranja, 2,000 m, 13°13'S, 73°95'W, *Guerrera 2034* (F). CAJAMARCA: Prov. Cajamarca, Huambos, 2,200 m, *Ferreyra 8409* (NY, USM); Prov. Jaén, Río Chamaya, Bagua-Olmos, 35 km E of Pucara, 70 km W of Río Marañon bridge, 630 m, 6°0'S, 78°52'W, *Croat 58366* (AAU, C, CAS, CM, GH, K, KYO, MO, NY, SEL, U, US, USM). CUZCO: Prov. Calca, Vilcabamba, 2,700 m, *Vargas 3988* (CUZ); Prov. Convención, Choquellowanca, 1,450 m, *Vargas 12947* (CUZ); Cuzco-Kiteni, Cocalpampa, 150 km NW from Cuzco, 1,210–1,435 m, *Nuñez et al. 6816* (MO); Rosario Mayo, 950–1,200 m, *Chávez 3334, 3336* (MO), *Vargas 20674* (US); Quillabamba-Cuzco, just S of Quillabamba, 1,050–1,200 m, 12°20'S, 72°44–45'W, *Croat 50919* (CM, MO), *50962* (COL, M, MO, MY, USM); Santa Teresa-Chaullay, at Quellomayo, 139 km from Cuzco, 1,200–2,600 m, 13°08'S, 72°36'W, *Nuñez & Motocanchi 8752* (MO); Urusayhua, 1,400 m, *Chávez 507* (MO); Río Mopillo, Yupanqui-Río Apurimac, Pomobamba, 2,000 m, *Davis et al. 1261* (F, SEL); Río Urubamba, Quillabamba, 1,100 m, *Solomon 3111* (MO, F); Prov. Quispicanchis, Cadena, 1,060 m, *Vargas 6209* (CUZ); Masca Pata, Hda. Itio, 2,000 m, *Vargas 3053* (CUZ); Prov. Urubamba, Km 88–92, 2,500 m, *Vargas 3396* (CUZ); km 110 Machupicchu-Cuzco, 2,000 m, 13°09'10"S, 72°31'W, *Nuñez 8679* (MO); 2,900 m, *Nuñez 8423* (MO); Machupicchu, *Jackson & Jackson P-1* (F); 2,000 m, *Bogner 904* (K); 2,300 m, *Vargas 21642* (CUZ, MO); 2,300 m, *Zahner s.n.* (M); railway, Km 96, 2,300 m, *Palmer 181* (K); Laderas, 2,100 m, *Vargas 2982* (CUZ); Papacahua, 4 stops on railroad above Machupicchu, 2,500 m, 13°11'S, 72°30'W, *Croat 50969* (MO); Tankarpata, 2,650 m, *Vargas 13576* (CUZ, US). HUÁNUCO: Tingo María Region, Huamincha, 1,800 m, *Woytkowski 34220* (F, G, MO, UC); Prov. Huánuco, Acomayo, 2,300 m, *Woytkowski 34331* (F, MO, UC); Río Tulca, Huánuco-Tingo María, km 443, 6 km N of Acomayo, 2,450 m, 9°04'S, 76°04'W, *Croat 57842* (CAS, CM, MO, NY, RSA, SEL, US, USM). JUNÍN: Prov. Acobamba, Acobamba-Oxapampa, Carretera 20B, 23 km NE of Acobamba, 2,170 m, *Jones 9138* (LAM, MO); Prov. Tarma, Tarma-Oxapampa, 38 km NE of Tarma, on Carretera 20B, 2,226 m, *Jones 9105* (LAM); Tarma-San Ramón, 1,000–3,000 m, 11°10'S, 75°20–45'W, *Sullivan et al. 1067* (F, MO, SEL); 2,400 m, 11°10'S, 75°33'W, *Smith & Canne 5931* (B, MO); Carpapata, 2,400–2,500 m, *Cerrate 2810* (USM); Huasahuasi, 2,760 m, *Hutchison 4164* (UC, US); Huacapistana, rd. to Palca, *Weberbauer 1975, 2007, 2158* (B); Huacapistana, 1,800–2,400 m, *Killip & Smith 24328* (NY, US); Matichacra, near Huacapistana, 2,100–2,200 m, *Ferreyra 11180* (NY); 28–34 km NE of Tarma, 2,400–2,500 m, *Dillon & Turner 1354* (F, MO), *Croat 57707* (AAU, B, BM, K, MO, RSA, U, USM), *Gentry & Tredwell 37285* (MO). LA LIBERTAD: Río Santo Domingo, Piedra Grande, 1,670 m, *Macbride 3668* (F). PASCO: Prov. Oxapampa, Palmazu, 2,100 m, 10°32'S, 75°23'W, *Smith et al. 8495* (MO). SAN MARTÍN: Rioja-Pomacocha, km 291, near Amazonas border, Venceremos, 1,850 m, 5°45'S, 77°40'W, *Gentry et al. 45343* (MO); Moyobamba-Chachapoyas, Km 400–404, 1,150–1,280 m, 5°45'S, 77°29'W, *Croat 58204* (MO, USM), *58192, 58207* (MO).

Anthurium ernestii Engl., Pflanzenr., IV. 23B(Heft 21): 80. 1895.

a. **Anthurium ernestii** var. **ernestii**. TYPE: Peru. San Martín: Pongo de Cainarachi, *Ule 6325* (lectotype, B). Figures 124, 128–130.

Epiphytic; stem 6–20 cm long, 1–3 cm diam.; roots dense, green, whitish when dried, velutinous, 2–5 mm diam.; cataphylls subcoriaceous, 2-ribbed, 3–12 cm long, acuminate at apex, drying reddish brown to light brown (B & K yellow-red 4/10), persisting intact, eventually as reticulum of fine, straw-colored fibers with the apex remaining intact. *Leaves* erect-spreading; petioles 4–30 cm long, 3–13 mm diam., D-shaped, sulcate and with a medial rib adaxially, the margins acute, rounded to 1–5-ribbed abaxially; geniculum thicker and paler than petiole, 0.5–2.3 cm long; sheath 1.5–6 cm long; blades subcoriaceous, elliptic to oblanceolate to oblong-oblanceolate, acute to acuminate at apex (the acumen flat), attenuate to obtuse, rarely rounded at base, (25)40–60(131) cm long, (6)7–20(36) cm wide, broadest at or above the middle, the margins broadly undulate, frequently concave in the lower part of the blade; both surfaces matte to semiglossy, generally drying green; midrib broadly and acutely raised at base, becoming flat toward the apex above, acutely raised below with a prominent central ridge at base, becoming slightly convex at apex; primary lateral veins 6–15 per side, departing midrib at 30–70° angle, straight to arcuate-ascending to the margin, prominently raised near the midrib, flat to sunken near the margin above, prominently raised below, drying orangish; tertiary veins prominulous, raised on both surfaces; collective vein arising in the upper ⅓ of the blade, 5–13 mm from margin. *Inflorescences* erect; peduncle 3–25(45) cm long, 2–6 mm diam., 0.5–3(5.7)× as long as petiole, pale green, terete; spathe erect to reflexed or recurled, subcoriaceous, green to green tinged with red at base (B & K yellow-green 6/7.5), lanceolate to broadly lanceolate, 4–12 cm long, 1–3(4) cm wide, broadest near base or sometimes at or near middle, inserted at 45–80° angle on peduncle, abruptly acuminate to acute at apex, acute at base; spadix pinkish to magenta to purplish or green at anthesis, sessile, rarely stipitate to 0.5–1 cm, cylindroid, slightly tapered, erect, slightly curved, 3–11(20) cm long, 3–14 mm diam.; flowers 4-lobed, 1–1.9 mm long, 1.4–1.7 mm wide, the sides sigmoid; 5–8(17) flowers visible in principal spiral, 7–11(16) in alternate spiral; tepals matte, densely papillate; lateral tepals 0.4–1 mm wide, the inner margins straight to convex, the outer margins 2–3-sided; pistils raised, the exposed portion rectangular to squarish, often reddish violet, darker than tepals; stigmas slitlike to ellipsoid, 0.2–0.6 mm long; stamens emerging in a regular sequence, the laterals preceding the alternates by up to 27 spirals, the 3rd stamen preceding the 4th by up to 25 spirals; filaments ca. 0.6 mm long, 0.8 mm wide; anthers purplish or pinkish to pinkish white, 0.2–0.7 mm long, 0.4–0.6 mm wide, inclined over and obscuring the pistil; thecae ellipsoid, not divaricate; pollen pale yellow fading to white. *Infructescence* spreading; spathe withered; berries red-violet to violet (B & K purple 3/10–4/10), subglobose to obovoid, rounded at apex, 4–10 mm long, 3–6 mm diam.; seeds 1–2 per berry, obovoid, 2–4 mm long, 1.5–2.5 mm diam., creamy brown, with sticky appendage at apex; mesocarp grayish, juicy, somewhat mealy.

Anthurium ernestii var. *ernestii* ranges throughout western Amazonia, from southern Colombia (Putumayo) to Peru (Amazonas, Loreto, San Martín, Huánuco, Pasco, and Madre de Dios), and western Brazil (Acre and Amazonas as far east as the Rio Madeira), mostly below 500 m (rarely to 800 m) in tropical moist, premontane wet, and tropical wet forest life zones.

This species is recognized by its fine, thin, pale brown to pale tan network of cataphyll fibers with the uppermost cataphylls often skeletally intact or nearly so and by its oblanceolate leaf blades which generally dry green or greenish brown with the primary lateral veins more or less orange (especially on the lower surface). Also characteristic is the generally short peduncle and especially the cylindroid spadix which is about 5–8× (rarely to 13×) longer than broad and often has a minutely prickly appearance owing to the tight clusters of stamens and the upturned tepals on dried collections (or more rarely the exserted styles).

Like most of the widespread species of sect. *Pachyneurium*, *A. ernestii* var. *ernestii* is quite variable overall and is not easily understood when only specimens representing a portion of the geographical and/or morphological extremes are at hand. Among the most variable characters for the species are spadix and fruit color. Spadix color has been reported as greenish yellow, pale green, pale olive-green, orange-buff, pink, pinkish, yellowish pink, grayish pink, light purplish pink, reddish, reddish brown, light pink-brown, purplish white, light violet, violet, pale purple, purple, reddish cream, or cream turning magenta. It is generally not a dark color (at least at anthesis), nor a color easily qualified. As in many species of *Anthurium*, the spadix often changes color during the course of anthesis. Fruits are variously described as violet, dark violet, bright purple, purple, or red.

The morphological plasticity of *Anthurium ernestii* is rather remarkable and is geographically clinal in nature, with plants increasing in size from north to south. In Ecuador, most notably in Napo, plants tend to be relatively small with short petioles and small inflorescences, and leaves mostly drying distinctly green with the characteristic orangish primary lateral veins. Additionally, leaf blades are proportionately narrower in Ecuador (averaging 4.6× longer than broad) than in Peru (averaging 3.4× longer than broad).

Peru is believed to be the center of distribution for the broadly interpreted taxon comprising *Anthurium ernestii*, and the departments of Loreto (including newly created Ucuyali Department), San Martín and Madre de Dios in particular harbor the greatest amount of morphological diversity. This is particularly true of the Río Huallaga and Río Ucayali basins (especially the region between the east banks of the latter and Acre, in Brazil).

In Loreto, and to a lesser extent in Huánuco and Pasco, the specimens seen exhibit an overall tendency toward a significant increase in size and show a greater departure from the "typical" condition of leaves drying green or greenish. Many dry brown or brownish green, but still largely exhibit the orangish primary lateral veins.

Anthurium ernestii typically has a peduncle about twice as long as the spadix, but in San Martín Department a few collections from Distrito Tocache Nuevo are very large in overall size and have peduncles 30–42 cm long and about 3× longer than the spadix. The number of flowers per spiral for the spadices of these plants represents the higher range limit for the taxon.

Peduncle length in relation to petiole length is greater in the northern part of the range (a collection from southern Colombia has a peduncle 5.7× longer than the petiole, the greatest disparity observed). In Peru, the peduncles are normally about equally as long as the petioles. Overall, the peduncle is commonly no more than 3× longer than the spadix.

Anthurium ernestii appears to be most closely related to *Anthurium galactospadix*. It differs at once from *A. ernestii* in having the spathe longer than the stouter spadix, and in having more (13–28) flowers per spiral.

Anthurium ernestii is apparently also closely allied to *A. uleanum*, which is largely sympatric. In general, *A. uleanum* may be distinguished from *A. ernestii* by its more slender, glaucous-looking spadix, longer peduncle and petioles, and leaf blades which mostly dry brown. In addition, *A. uleanum* lacks the characteristic pale, skeletally intact cataphylls and orangish drying primary lateral veins of *A. ernestii*. Occasionally, spadices of dried collections of what are believed to be *A. ernestii* var. *ernestii* may have a thin, waxy layer when they are very young, but this is usually soon sloughed off, at least before anthesis. *Harling 1118* is an example.

Anthurium ernestii comprises two varieties, with var. *ernestii* encompassing the range of the species. Variety *oellgaardii*, which occurs in central Ecuador in Pastaza, differs from the typical variety in having a proportionately more slender, tapered spadix, a spreading, rather than erect, peduncle, and leaves which dry bright green. In Ecuador, peduncle length for var. *ernestii* ranges up to the lower limit for var. *oellgaardii*, but rarely exceeds it and is often much shorter.

A source of possible confusion is a Field Museum photograph of the type of *A. ernestii*. It depicts two different herbarium specimens. The one on the left (*Ule 6325*) is the lectotype of *A. ernestii*. The specimen on the right (apparently now lost) is labeled *Ule 5776* and closely resembles the specimens discussed under *A. galactospadix* (*Cid & Nelson 2563*, *Prance et al. 7471*). The latter specimen consists of part of a leaf blade, a petiole, and an inflorescence. This specimen apparently represents a mixed collection since a note on the specimen indicates that *Ule 5776* is actually a Gesneriaceae and that the specimen in the photograph is possibly *Ule 5788*. However, *Ule 5788*, represented by a plant at Geneva, is a species with a much shorter petiole than the one depicted in the photograph.

BRAZIL. ACRE: Mpo. Cruzeiro do Sul, Mpo. Caramari Amazonas, Rio Jurua, N of Cruzeiro do Sul, 150 m, 7°137'S, 72°136'W, *Croat 62482* (F, MO, TEX), *Croat 62492* (MO); Rio Moa, Boiador, 150 m, 7°37'S, 72°37'W, *Croat & Rosas 62302, 62303* (CAS, INPA, MO), *62408* (INPA, MO). AMAZONAS: Boca do Acre, *Prance et al. 2338* (INPA); Rio Jurúa, *Ule 5788* (G); Mpo. Humayta, Rio Madeira, Tres Casas, *Krukoff 6097* (NY), *Krukoff 6496, 6548* (GH, NY), *Krukoff 6547* (GH, K, NY). COLOMBIA: PUTUMAYO: El Wiskey, 13 km S of Umbria, vic. Finca Santa María, 300 m, *Plowman 2066-A* (F). ECUADOR: MORONA–SANTIAGO: Patuca, 600 m, *Harling 1118* (S); Río Paute, Méndez, 700 m, *Harling 1090* (S); Mendez–Paute, 600 m, 2°44'S, 78°19'W, *Lojtnant & Molau 14549* (AAU); Yurupaza, 600 m, 2°40'S, 78°14'W, *Harling 984* (S). NAPO: 3 km E of Anangu, Communa San Isla, 260 m, 0°29'S, 76°21'W, *Lawesson et al. 39799* (AAU); Puerto Bolívar–Comunidad Siona, S of propriety of Victoriano Criollo, *Jaramillo & Coello 2850* (AAU, QCA); Puerto Napo–Puerto Misahuallí at jct. with Río Napo, 3.5 km E of Puerto Napo, 1°02'S, 77°47'W, *Croat 58885* (MO); 2–5 km SSW to WSW of San Pablo de las Secoyas, path to Shushufindi, 300 m, 0°15'S, 76°21'W, *Brandbyge et al. 32548, 32796, 33359, 33412, 36222* (AAU); trail to Shushufindi, E of San Pablo de Las Secoyas, *Jaramillo & Coello 2685* (AAU, QCA); N of San Pablo de Las Secoyas, *Jaramillo & Coello 2804* (AAU, QCA); Orellana, Sector Huashito, 20 km N of Coca, 250 m, 0°20'S, 77°05'W, *Gudino 211* (MO); San Pueblo, 35 mi. E of Lago Agrio, *Hodgson 165* (K); Lago Agrio–Puerto El Carmen de Putumayo, vic. Tarapoa, 76 km E of Lago Agrio, 240 m, 0°07'N, 76°23'W, *Croat 58632* (MO); Río Aguarico, Cuyabeno, S of the river, 200 m, 0°17'S, 75°53'W, *Holm-Nielsen et al. 21543* (AAU, MO); Dureno, *Pinkley 245* (ECON), *Jaramillo & Coello 3029* (QCA); Lago Agrio, 7.2 km S of Río Aguarico, 270 m, 0°02'N, 76°51'W, *Croat 58643A* (MO, NY, QCA), *58642* (MO, QCA); 350 m, *58689* (MO, QCA); 17.3 km N of Lago Agrio, 0°07'N, 76°50'W, *Croat 50304* (MO); Lagunas de Cuyabeno, 300 m, 0°01'S, 76°11'W, *Brandbyge et al. 33983* (AAU), *36079* (AAU, MO); 265 m, *Poulson 80804* (AAU), *Nielsen 76092* (AAU); Reserva Faunistica de Cuyabeno, N of Laguna Grande, 265 m, 76°11'W, 0°01'N, *Balslev et al. 84417* (AAU); Río Shushufindi, near confluence with Río Aguarico, 300 m, 0°18'S, 78°20'W, *Balslev 4831* (NY); Tena–Puyo, 5 km S of bridge over Río Napo, 510 m, 1°05'S, 77°47'W, *Croat 58921* (MO); Tena, *Asplund 9423* (S); 5.7 km W of Tena, 500 m, 00°01'S, 77°51'W, *Croat 58855* (MO, QCA); Río Cotapino, 50 km NE of Tena, Cotapino, 500 m, *Harling et al. 7023* (GB); Río Arajuno, Hacienda Aguinda, 450 m, 1°07'S, 77°36'W, *Marles EE 13A* (F); Río Due, Baeza–Lago Agrio, Km 65, trail to Chuscuyacu, "Zona Reserva Ecológica Cayambe–Coca," *Jaramillo & Coello 3061* (AAU); Río Napo, Ahuano, 1°04'S, 77°31'W, *Lugo 245* (GB, MO); Parque Nacional Yasuní, Anangu, 260–350 m, 0°31–32'S, 76°23'W, *Lawesson et al. 39473* (AAU), *Luteyn & Mori 8530* (NY), *Luteyn et al. 8700* (MO); Pozo petrolero Daimi 2, 200 m, 0°55'S, 76°11'W, *Cerón & Hurtado 4088, 4238* (MO); near confluence with Río Aguarico, Ballesteros (military post), *Harling et al. 7368* (GB, MO); confluence of Río Coca and Río Napo, Coca, 350 m, *Harling & Andersson 11798* (GB); Coco–Las Sachas, 0°25'S, 76°55'W, 250 m, *Ceron et al. 2425* (MO, QCNE); Coca, Río Payamino, 350 m, *Harling & Andersson 11928* (GB); Payamino, Reserva Floristica "El Chuncho," 0°30'S, 77°1'W, 250 m, *Ceron et al. 2275* (MO, QCNE), *2286* (MO, QCNE), *2516* (MO, QCNE); E of Puerto Misahuallí, 400 m, *Besse et al. 1194* (SEL); 8 km below Puerto Misahuallí, 1.5 km S of Río Napo, 450 m, 1°04'S, 77°36'W, *Palacios et al. 448* (MO, NY, QAME, QCNE); Santa Rosa, 32 km E of Tena, 0°01'N, 77°30'W, *Lugo 2065* (GB); Río Napo–Tena, 8 km SE of Tena, Shinguipino, 480 m, *Grubb et al. 1530* (K, NY); Jatún Sacha Biological Reserve, 8 km ESE of Puerto Misahuallí, 400 m, 1°04'S, 77°37'W, *Miller et al. 2198, 2200* (MO); 400 m, *Cerón 1330* (MO, QCNE), *1742* (MO, QCNE), *1694* (MO, QCNE), *2578* (MO, QCNE), *2671* (MO, QCNE); Río Pacuno, Bimbino, 300 m, 0°40'S, 77°20'W, *Whitmore 746* (K); Río Putumayo at Colombian frontier, Baeza–Puerto El Carmen de Putumayo, 43.7 km SE of Lago Agrio, 16.9 km SE of Dureno, 2.1 km W of Guarumo, 240 m, 0°7'N, 76°39'W, *Croat 58591* (MO, QCA); Río Wai si aya, northern tributary of Río Aguarico, 300 m, 0°15'S, 76°21'W, *Brandbyge et al. 32652, 32653, 36195, 36199* (AAU); Yasuní Nacional Parque, 200 m, 0°55'S, 76°11'W, *Cerón & Hurtado 3866* (MO), 230 m, 0°52'S, 76°05'W, *Cerón 3345* (MO); Río Yasuní, 180–200 m, 1°05'S, 75°35'W, *Lawesson et al. 43314, 43320* (AAU); Lago Garza Cocha, 200 m, *Lawesson et al. 43500* (AAU); 80 km upriver from Nuevo Rocafuerte, 225 m, *Foster 3671, 3703B* (F), *Alarcon 47* (QCA); Cantón Lago Agrio, Dureno, 350 m, 0°2'S, 76°42'W, *Cerón 347* (MO), *Cerón & Cerón 3131* (MO); Cantón Orellana, sector Huashito, 20 km N of Coca, 250 m, 0°20'S, 77°05'W, *Rubio 259* (MO); Cantón Tena; Río Blanco community at headwaters of Río Huambuno, 6 km NNW of Ahuano, 440 m, 1°00'S, 77°40'W, *Kohn 1136* (MO). PASTAZA: Puyo–Diez de Agosto, 8.2 km NE of Diez de Agosto, 970 m, 1°27'S, 77°51'W, *Croat 59051* (MO, QCA); Río Bobonaza, oil exploration camp Chicirota, 300 m, 2°22'S, 76°40'W, *Oellgaard et al. 35301* (AAU); Río Capihuari, tributary of Río Pastaza, 285 m, 2°30–31'S, 76°50–55'W, *Oellgaard et al. 35102* (AAU); Río Curaray, S side of river, mouth of Río Queramo, 230 m, 1°30'S, 76°32'W, *Neill & Palacios 6775* (MO, NY, QAME), *Palacios & Neill 719* (K, MO, QAME); N side of river, las lagunas Potoamo, 230 m, 1°30'S, 76°30'W, *Neill & Palacios 6818* (MO, NY, QAME); Lorocachi, 200 m, 1°36–38'S, 75°58–59'W, *Jaramillo et al. 30918, 31150, 31568, 31584* (AAU), *30965B* (MO), *31188* (AAU, MO); Centro–Oriente, Tzapino, *Jaramillo & Coello 3602* (QCA), *3644* (QCA); Tiwaeno, *Jaramillo & Coello 3207* (QCA). PERU. AMAZONAS: Prov. Bagua, Río Cenepa, Isla de Chigkan, 330 m, *Kayap 320* (MO); Quebrada de Apigkagentsa, 720 m, *Kayap 602* (MO); Quebrada Etseketai, 240 m, *Kayap 841* (MO); Huampami, ca. 5 km E of Chávez Valdivia, 200–250 m, 4°30'S, 78°30'W, *Ancuash 1095, 1260, 1336* (MO), *Berlin 2046* (MO), *2080* (MO, PMA), *Kujikat 72, 161, 237, 302* (MO); S of Huampami, S of river, 266–283 m, *Berlin 1689* (MO); S of Huampami, trail to Sasa, 250 m, *Berlin 1707* (MO); above Quebrada Tuhusik, 5 min. down river from Chávez Valdivia, 230–270 m, *Berlin 560* (MO); Río Cenepa–Quebrada Kayamas, 270–300 m, *Berlin 514* (MO); Río Huampami, 250–280 m, *Kayap 1251, 1339* (MO); Río Marañon, above Pongo de Manseriche, 200 m, *Wurdack 2456* (US), *Mexia 6132a* (UC); Río Santiago, E of the river, Galilea, 180 m, *Huashikat 71* (MO); Quebrada Caterpiza, 2–3 km behind community of Caterpiza, 65 km N of Pinglo, 200 m, 3°50'S, 77°40'W, *Huashikat 1793, 2025, 2086, 2275* (MO), *Tunqui 395, 690, 712, 840* (MO); 1–2 km below La Poza, 180 m, *Leveau 3, 264, 306, Peña 84* (MO); 400 m behind La Poza, 180 m, *Huashikat 142* (MO); behind house of Jaime Braga, *Leveau 59* (MO); Chiriaco–Puente Venezuela, 43 km NE of Chiriaco, 350–800 m, *Barbour 4429* (MO); E of Huampami, trail to Shaíme, 200–600 m, *Berlin 1918* (MO); trail E from La Peca into Serranía de Bagua, 1,000–1,400 m, *Gentry et al. 23090* (MO); Quebrada Wampushik, 310 m, *Kayap 936* (MO); Mesones–Muro Hwy., 8 km E of Montenegro, at km 286, 8 km E of Montenegro, 650 m, 5°20'S, 78°20'W, *Hutchison & Wright 3764* (UC). HUÁNUCO: Tingo María Region, Bella Durmiente, 700 m, *Ferreyra 13808* (USM); Tingo María–Monsón, Cuevas de Gucharo "Parque Nacional Tingo María," Río Patay, 650 m, 9°21'S, 76°12'W, *Croat 57930* (MO); Prov. Leoncio Prado, Dtto. Rupa Rupa, Río Huallaga, 700--800 m, *Croat 21023* (MO); 750–800 m, *Plowman & Ramirez 7568* (F, MO); Tingo María Region, 675 m, *Croat 50978* (MO, RSA), *Solomon 3388* (MO); W of Tingo María, 700–800 m, *Schunke 10516* (MO); Prov. Pachitea, W of Codo de Pozuzo, 500–1,000 m, 9°40'S, 75°28'W, *Foster 9217* (MO); Bosque Nacional de Iparia, Río Pachitea, 1 km above Tournavista, near Miel de Abeja, 300–400 m, *Schunke 1827* (F, NY, US), *2240* (F). LORETO: Río Ampiyacu, Pucaurquillo, *Davis et al. 819* (F, SEL); Prov. Alto Amazonas, Balsapuerto, 150–350 m, *Killip & Smith 28695* (F, NY, US); Río Huallaga, Lagunas, *Croat 17838* (MO, USM); Yurimaguas, 135–200 m, *Ferreyra 4949* (USM), *Killip & Smith 28074* (NY, US); Puerto Arturo, below Yurimaguas, 135 m, *Killip & Smith 27733* (NY, US); Río Paranapara, Yurimaguas, less than 500 m, *Croat 17931* (MO); Río Pastaza, Andoas, 180 m, 2°55'S, 76°25'W, *Croat 51255* (CM, MO), *Vásquez 4435* (MO), *Vásquez & Jaramillo 848* (MO, RSA), *Vásquez et al. 2985* (MO); Prov. Loreto, San Jose de Parinari, 150 m, 4°32'S, 74°30'W, *Vásquez & Jaramillo 3326* (MO); Pucayacu (native community Shimaco-Urarina), *Vásquez 6036* (MO); Río Marañon, 1 hr. above Saramuro, 4°40'S, 75°00'W, *Diaz & Ruiz 872* (MO, SEL); Río Samaria, Atuncocha, *Vásquez et al. 4362* (MO); Río Santiago, 200 m, *Mexia 6142a* (MC, UC); Campamento 2-Flor de Yarina, 140-160 m, 5°02'S, 74°30'W, *Gentry et al. 38068* (MO); Prov. Maynas, Sacarita de Yanayacu, 90 m, *McDaniel & Rimachi 25633* (MO), *25668, 25684* (IBE, MO); Santa María de Nanay, Quebrada Yarina, 150 m, 3°55'S, 73°40'W, *Vásquez et al. 12200* (MO, US); Iquitos Region, Río Maniti, Recreo, NE of Iquitos, 115 m, 3°42'S, 72°50'W, *Vásquez & Jaramillo 1139* (MO); Río Itaya, Sanangal, 120 m, 4°10'S, 73°20'W, *Vásquez et al. 315* (MO); Quebrada Tahuayo, above Tamishiyaco, *Croat 19708, 19744* (MO); Río Amazonas, village Yanamono, near mouth of Río Napo, 150 m, 3°25'S, 72°50'W, *Croat 50125* (from a live plant collected by A. Gentry) (MO); Yanamono, Explorama Tourist Camp, *Croat 61762* (AMAZ, MO, WIS), *Gentry et al. 31496, 36637, 61833* (MO), *Gentry 29912A* (MO); Mariscal Castilla, 106 m, 3°55'S, 70°30'W, *Vásquez & Jaramillo 9344* (MO); Río Gueppi, tributary of Río Putumayo, 8 km from mouth of river, Puerto Peru-Río Napo trail, 200 m, *Gentry et al. 21963* (F); Explorama Inn, ca. 2 km W of Indiana, 130 m, *Gentry et al. 55988* (MO); Río Napo, *Croat 20188* (MO); Río Yaguasyacu, trib. of Río Ampiyacu, Brillo Nuevo, 2°40'S, 72°00'W, *Balick et al. 1040* (GH); Prov. Maynas, Dist. Iquitos, Iquitos Region, Río Momón, Quebrada Momoncillo, 200 m, 3°43'S, 73°20'W, *Croat 51223* (BM, CAS, MO, USM); Prov. Maynas, Dtto. Amazonas, Quebrada Yanamono, below Indiana, 120-140 m, *Rimachi 1198* (MO). MADRE DE DIOS: serranía across Río Alto Madre de Dios from Shintuya, Pantiacolla, 480-840 m, *Gentry et al. 27359* (MO); confluence of Río Tambopata and Río La Torre, 39 km SW of Puerto Maldonado, 12°50'S, 69°20'W, *Smith et al. 118, 610* (US), *638* (NY, US), *Smith 230* (US), *Smith 307* (MO, US); Manú National Park, Cocha Cashu Uplands, 400 m, 11°45'S, 71°0'W, *Nunez 5549* (CUZ, MO, USM); Río Manu, 350-400 m, *Davidson 117* (MO), *Foster 5811* (F), *Foster & Terborgh 6482* (F); Tambopata Wildlife Reserve, 30 km S of Puerto Maldonado, 260 m, 12°15'S, 69°17'W, *Young & Stratton 120, 141* (MO), *Young 18* (MO, NY); Prov. Manu, Río Palotoa (Río Panticolla), tributary of Alto Madre de Dios, NW of Shintuya, 500 m, *Foster & Terborgh 6749* (F). PASCO: Prov. Oxapampa, Iscozazin-Villa America, 350-450 m, 10°11'S, 75°15'W, *Smith 2854* (MO, US); Palcazú Valley, Iscozacin, less than 500 m, *Salick 7265* (MO); Río Pichis, 10 km downriver, E of island, Puerto Bermudez, Reserva Musmuqui "Nuevo Hoboken," *Foster & Wright 8041, 8127* (F), *Kuntze 2006* (NY). SAN MARTÍN: Tocache Nuevo-Juanjui, 84 km S of Juanjui, 14.1 km beyond bridge over Río Pulcache, 600 m, 7°41'S, 76°40'W, *Croat 58029, 58031A* (MO), *58030* (CM, MO, USM); Pongo de Cainarachi (Shanusi), *Ule 6325* (B); Prov. Mariscal Cáceres, Madre Mía, 760-880 m, *Boeke & Ramírez 1281* (NY); Prov. Mariscal Cáceres, Dtto. Tocache Nuevo, Tocache Nuevo, E of bridge, 500 m, *Schunke 7790* (MO); Quebrada de Cañuto, 500 m, *12107* (IBE); Colegio Agropecuario de Tocache, 400 m, 8°13'S, 76°32'W, *Croat 57994* (CAS, F, DUKE, GH, M, MO, RSA, SEL, TEX, US, USM), *57995* (B, K, MO, USM); 5 km S of Cachaco, 42 km N of Tocache Nuevo, 330 m, 7°58'S, 76°38'W, *Croat 58048* (MO, NY, USM); Fundo de Las Flores, 550-600 m, 8°10'S, 76°33'W, *Croat 50991* (CM, MO), *50992* (F, MO, SEL), *50993* (MO, NY), *50994* (B, CM, IBE, K, M, MO, RSA, USM); Fundo Geoglifico del Sr. Luis Luden, Quebrada de Ishichimi, 400 m, *Schunke 8107* (MO); Granja Santa Ysabel, old rd. to Limón, 400 m, *Schunke 10326* (MO); Palo Blanco, W of bridge, 600-700 m, *Schunke 5624* (F, NY, U, US); Palo Blanco, E of bridge, road to Shunte, 500-800 m, *Schunke 7391* (CM, MO); Quebrada Pucayacu, chacra del Sr. Alfredo Sinarahua, 400 m, *Schunke 12001* (IBE); Río Huallaga, W of Escuela de Balsa Probana, 400 m, *Schunke 3637* (COL, F, NY, US); 1-2 km downriver from Tocache Nuevo, Miramar, 500 m, 8°10'S, 76°28'W, *Plowman et al. 11417* (F, USM); Quebrada de Tanta, *Schunke 4045* (F); Río Tocache, Fundo Melodia, road to Shunte, 800 m, *Schunke 7496* (CAS, MO); Río de La Plata, 550-650 m, 8°10'S, 76°25'W, *Croat 51000, 51029, 51033, 51035, 51041* (MO), *51002* (MO, USM); 5 km NE of bridge over Río Huallaga, Fundo del Sr. Manuel Gatica, less than 100 m, 8°08'S, 76°23'W, *Croat 57986* (MBM, MO, USM), *57987* (CM, MO, RSA, USM), *57988* (F, MO, P, US, USM); Fundo del Sr. Manuel Gatica, 660-700 m, *Schunke 12136, 12138, 12186* (MO); NE of Tocache Nuevo, 400-600 m, *Schunke 8354, 8372, 8373, 8375* (F, MO), *8376* (F, MO, NY). UCAYALI: Prov. Ucayali, Río Pisqui, 7°45'S, 75°01'W, *Tessman 3249* (NY); Prov. Colonel Portillo, Km 99 on Carretera Federico Basadre, Arboretum Von Humboldt, 350 m, 8°45'S, 75°05'W, *Díaz et al. 680* (K, MO); Arboretum Von Humboldt-Puerto Inca, 5 km E of Pucallpa-Tingo María road, Km 86, less than 500 m, 8°17'S, 74°58'W, *Croat 51051* (MO); Bosque Nacional de Iparia, NW of Río Ucayali, 1 km below Iparia, 250 m, 9°12'S, 74°30'W, *Schunke 2783* (F, NY).

b. Anthurium ernestii var. **oellgaardii** Croat, var. nov. TYPE: Ecuador. Pastaza: between oil exploration camp Chichirota & Destacamento Cabo Pozo, 300 m, 2°25'S, 76°39'W, *Oellgaard et al. 34881* (holotype, MO 3039089; isotypes, AAU, QCA). Figure 131.

Differt a var. typicum pro pedunculo longiore et spadice graciliore elongatoque.

Description based on dried material only. Epiphytic; stem 1-1.5 cm thick; roots dense, whitish or brownish, velutinous, moderately short, 1-3 mm diam.; cataphylls subcoriaceous, lanceolate, unribbed, 5-8 cm long, acuminate at apex, tan, persisting as reticulum of fine and dilacerated fibers. *Leaves* erect-spreading; petioles 7-15 cm long, 3-6 mm diam., D-shaped, sulcate with a prominent medial rib and erect margins adaxially, 3-5-ribbed abaxially; geniculum thicker than petiole, 0.5-1 cm long; sheath 3-5.5 cm long; blades subcoriaceous, obovate to oblanceolate-elliptic, short-acuminate at apex, gradually attenuate toward the base, acute to obtuse at base, 54-87(100) cm long, 18-34 cm wide, broadest above the middle, the margins broadly undulate; midrib acutely raised above, obtusely raised and faintly reddish below; primary lateral veins 10–16 per side, departing midrib at 30–50° angle, straight to arcuate-ascending to the margin, prominently raised above, less so below; tertiary veins raised, prominulous; collective vein arising in the upper ⅓ of the blade, raised above and below, prominulous, 2–10 mm from margin. *Inflorescences* spreading-pendent; peduncle 23–54 cm long, 3–9 mm diam., 2.2–4.5(5.9)× as long as petiole, terete; spathe reflexed, subcoriaceous, greenish, sometimes tinged with violet-purple, oblong-oblanceolate, 5–30 cm long, 0.9–3.5 cm wide, inserted at 40–70° angle on peduncle, acuminate at apex, acute at base; stipe 5–20 mm long in front, 1–10 mm long in back; spadix purple, cylindroid, slightly tapered, curved, erect, 7–8 cm long, 4 mm diam. near base, 3 mm diam. near apex; flowers 4-lobed, 1.2–1.5 mm long, 1.2–1.5 mm wide, the sides sigmoid; 5–6 flowers visible in principal spiral, 10–12 in alternate spiral; tepals minutely papilate, pale-punctate; lateral tepals 0.8 mm wide, the inner margins rounded, weakly scarious, minutely erose, the outer margins straight to rounded, 2-sided, paler; stigma oblong-ellipsoid, 0.3–0.7 mm long, 0.1–0.3 mm wide; anthers 0.5 mm long, 0.5 mm wide; thecae oblong-ellipsoid, slightly divaricate. *Infructescence* pendent; spathe persisting; spadix 7–60 cm long, 0.7–3 cm diam.; berries dark violet-purple in upper ⅓ becoming whitish toward the base, subglobose to cylindroid, 5–10 mm long, 3–4 mm diam.; pericarp with white raphide cells; seeds 2.8–4 mm long, 1.5–1.9 mm wide, 1.0–1.2 mm thick, with a gelatinous, transparent appendage at both ends.

Anthurium ernestii var. *oellgaardii* is known at present only from east central Ecuador in the province of Pastaza in the vicinity of the type locality on the Río Bobonaza and Río Bufeo at about 300 m in a tropical moist forest life zone. Some of the collections are reported from periodically flooded forest dominated by *Mauritia* palms.

This variety is distinguished by its large, broadly oblanceolate blades, which dry green with reddish brown or yellowish major veins and are attenuate at the base, and especially by its long-pedunculate inflorescence which is spreading-pendent at anthesis and produces a stout purple infructescence to 60 cm long and 3 cm diam. in fruit. It is noteworthy that only the type specimen has an infructescence of such large dimensions; all others are substantially more slender.

This variety shares most features of the typical variety, except the slender, tapered spadix. The latter differs in its proportionally shorter, cylindroid, spadix, generally shorter peduncles (in relation to petiole length) which are erect, and blades which usually dry brownish or, if greenish, very rarely clear green.

Anthurium ernestii var. *oellgaardii* can also be confused with *A. uleanum*, which has similar leaves, a long peduncle, and a similar, tapered inflorescence. That species differs in having tepals which bear a waxy, powderlike, grayish white covering on drying, and leaves which dry brownish. In contrast, the tepals of *A. ernestii* var. *oellgaardii* are minutely granulose and glossy on drying, and the leaves dry green.

Most of the specimens examined are of fruiting material, and the upper limits of flowering spadix length are not known.

This variety is named in honor of Benjamin Oellgaard, who participated in several expeditions to Ecuador and who made all known collections of var. *oellgaardii*.

ECUADOR: PASTAZA: Río Bobonaza, Cachitama–outlet of Río Bufeo, 300 m, 2°20′S, 76°40′W, *Oellgaard et al. 34733, 34735, 34737* (AAU); Destacamento Cabo Pozo–oil exploration camp Chichirota, 300 m, 2°25′S, 76°39′W, *Oellgaard et al. 34881* (AAU, MO), *34882* (AAU); Destacamento Cabo Pozo–La Boca, near outlet to Río Pastaza, 275 m, 2°30–35′S, 76°38′W, *Oellgaard et al. 34933, 34937* (AAU); Río Bufeo, N tributary of Río Bobonaza, 300 m, 2°20′S, 76°40′W, *Oellgaard et al. 34764, 34801* (AAU), *34769* (AAU, MO).

Anthurium eximium Engl., Bot. Jahrb. Syst. 25: 412. 1898. TYPE: Costa Rica. Puntarenas: in forest near Punta Mala, *Tonduz 6768* (lectotype, BR; isolectotype, CR). Figures 125, 132.

Epiphytic; stem elongate, 10–100 cm long, ca. 1 cm diam.; roots ascending to descending, pale green, pubescent, moderately elongate, somewhat tapered, 3–5 mm diam.; cataphylls subcoriaceous, narrowly lanceolate, 3.7–10 cm long, acute at apex with a subapical apiculum, yellowish green, drying brown, persisting intact, eventually deciduous. *Leaves* spreading; petioles 7–12 cm long, 6–7 mm diam., D-shaped to subterete, broadly to narrowly sulcate adaxially, the margins blunt or sharp, not raised, abaxially rounded to 3-ribbed; geniculum thicker and paler than petiole, 0.5–1 cm long; blades subcoriaceous, narrowly oblanceolate, long-acuminate at apex (the acumen apiculate), narrowly acute to acute to obtuse or narrowly rounded at base, 23–80 cm long, 3.3–11.5 cm wide, broadest above the middle, the margins weakly undulate;

upper surface weakly glossy to matte, medium green, lower surface weakly glossy to semiglossy, paler, drying matte, greenish; midrib obscurely and obtusely angular at base, becoming acutely raised toward the apex above, higher than broad at base, becoming round-raised toward the apex, conspicuously paler than surface below; primary lateral veins 10–12 per side, departing midrib at 40–45° angle, weakly arcuate to the collective vein, sunken above, raised below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins obscure above, slightly darker than surface below; collective vein arising from near the base, sunken above, raised below, equally as prominent as primary lateral veins, 1–4 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 29–32 cm long, 3–5× as long as petioles, green tinged reddish, terete; spathe spreading to reflexed, green, lanceolate-ovate to ovate, 5–7.7 cm long, 2–2.6 cm wide, clasping at base; spadix creamy white to yellow to grayish or brown, cylindroid to clavate, held at 90° angle to peduncle, 4.5–6 cm long, 8–10 mm diam. near base, 9 mm diam. near apex; flowers rhombic, 1.2–1.6 mm long, 1.3–1.8 mm wide; 10–12 flowers visible in principal spiral; tepals matte, densely papillate; lateral tepals 0.8–1.1 mm wide, the inner margins straight, the outer margins 2-sided; stigma ellipsoid, 0.3–0.4 mm long; stamens emerging somewhat irregularly in a complete sequence, the laterals preceding the alternates by 1–2 spirals; anthers pale white, 0.6–0.7 mm long, 0.5–0.6 mm wide; thecae oblong, not divaricate; pollen yellow, faintly aromatic at anthesis. *Infructescence* to 13 cm long, 1.5–1.7 cm diam.; berries pinkish to bright red, obovoid, ca. 4.6–7 mm long, 4–5 mm diam.; seeds 2 per berry, yellow, oblong, slightly flattened, 2.5–3.1 mm long, 1.2–1.5 mm diam., 0.9–1.2 mm thick.

Anthurium eximium is endemic to Costa Rica and is found strictly on the Pacific slope, in tropical wet forest formation from sea level to 800 m.

This species can be distinguished by the oblanceolate, epunctate leaves, persistent cataphylls, clasping, lanceolate spathe, cylindrical to clavate spadix, and bright red berries.

Anthurium eximium most closely resembles *A. bradeanum* and *A. spathiphyllum* (which are both restricted to the Atlantic slope), but differs from both by having entire cataphylls. *Anthurium bradeanum* also differs in having typically more elliptic leaf blades and 16–20 flowers per principal spiral (10–12 in *A. eximium*). *Anthurium spathiphyllum* also differs from *A. eximium* in having leaf blades with 20–30 primary lateral veins per side (vs. fewer than 13 in *A. eximium*).

In his monograph, Engler (1905) cited *Anthurium eximium* as a synonym of *A. consobrinum*. The leaf shapes in both species are very similar, but *A. eximium* has the collective vein arising from near the base, while *A. consobrinum* has the collective vein arising from about the middle. In addition, Schott's illustration of *A. consobrinum* clearly shows a long, slightly tapered spadix with pistils and berries greatly exceeding the tepals. *Anthurium consobrinum* is a common species of the Atlantic lowlands, and numerous collections are consistent with Schott's drawing. The berries of *A. consobrinum* are white with purple, pink, or orange apices as opposed to the solid bright red berries of *A. eximium*.

Anthurium eximium is a member of sect. *Pachyneurium* despite certain features it shares with sect. *Calomystrium*, including the thick, persistent, intact cataphylls, and the presence of linear raphide cells on both blade surfaces.

COSTA RICA. PUNTARENAS: 2.5 mi. SE of Golfito, along hwy. from Río Claro to Golfito, 60 m, 8°36'N, 83°4'W, *Croat 67622* (MO); Punta Mala, *Tonduz 6768* (BR, CR); Palmar Norte, 100–200 m, *Croat 35121* (MO); Santo Domingo de Golfo Dulce, *Tonduz 7260* (BR, CR, US); 100 ft., *Allen 5211* (US); Osa Peninsula, Corcovado National Park, 0–1 km W of park headquarters at Sirena, 0–200 m, *Gentry & Acevedo 48690* (B, CM, MO), *Knapp 2192* (MO, PMA), *Liesner 2846* (MO), *2996* (MO); Parque Nacional Corcovado, 0–150 m, 8°27–30'N, 83°33–38'W, *Kernan 70* (CR, F, K, MO); Rincon de Osa, 20–300 m, *Liesner 1934* (MO); 5 km W of Rincon de Osa, NW of airfield, 50–200 m, 8°42'N, 83°31'W, *Burger & Liesner 7286* (MO, NY); E base of Fila Barrigones, 1 km S and 2 km W of Cañasas, 12 km S of Rincon de Osa, 60 m, 8°34'N, 83°25'W, *Croat & Grayum 59823* (MO); Las Cruces Botanical Garden, *Croat 57240* (MO). SAN JOSÉ: Santa María de Dota, *Croat 55204* (MO); Cerro Pelón, N base, just E of main road, 0.5 km S of San Martín de Puriscal, 800 m, 9°44'N, 84°23'W, *Grayum & Baker 4694* (MO); Montañas Jamaica, 2.5 km NE of Bijagual de Turrubares, Carara Reserve, 460–520 m, 9°45'N, 84°33.5'W, *Grayum et al. 5478* (MO); Río Negro, ca. 1.5 km E of Santa Rosa de Puriscal, 320 m, 9°42'N, 84°23'W, *Grayum et al. 8339* (CR, MO).

Anthurium fasciale Sodiro, Anales Univ. Centr. Ecuador 19: 288. 1905. TYPE: Ecuador. Tungurahua: Río Pastaza, *Sodiro s.n.* (holotype, B; isotype, G). Figures 126, 133.

Epiphytic or terrestrial; stem climbing, to 50 cm long, 1–3 cm diam.; roots moderately few, descending, drying 2 mm diam.; cataphylls subcoriaceous, lanceolate, 14–24 cm long, acute at apex, drying whitish, straw-colored, persisting as a reticulum of fibers. *Leaves* mostly spreading; petioles 11–40(60) cm long, 5–11 mm diam., D-shaped, flattened or convex with an acute medial rib adaxially, the margins sharply raised, rounded abaxially; geniculum moderately thicker than petiole, 1–2 cm long; sheath 2–7 cm long; blades coriaceous, oblong-linear to broadly oblong, narrowly acute at apex, obtuse to shortly attenuate or narrowly acute at base, 47–120 cm long, 5–20 cm wide, broadest at or near the middle, the margins moderately to conspicuously undulate; upper surface weakly glossy to semiglossy, slightly quilted, dark green, lower surface semiglossy to glossy, slightly to moderately paler; both surfaces drying green to yellow-brown; midrib convexly raised, or sometimes acutely raised toward the apex above, paler than surface, acutely raised below; primary lateral veins 17–33 per side, departing midrib at 60–90° angle, slightly arcuate to the collective vein, convexly raised above, flat and darker than surface below, drying raised on both surfaces; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins moderately obscure above, darker than surface below, raised above and below when dried; reticulate veins obscure; collective vein arising from the base, equally as prominent as interprimary veins, (1)2–7 mm from margin. *Inflorescences* erect-spreading; peduncle 8–40(62) cm long, 2–8 mm diam., 0.6–2.3× as long as petioles, terete; spathe reflexed, subcoriaceous, green, ovate to broadly oblong, ca. 6.5–12 cm long, 1.5–3 cm wide, broadest in the lower half, the acumen inrolled, 4–8 mm long, acute to narrowly acute at base; spadix dark red, cylindroid to slightly tapered, sessile or stipitate to 5 mm, erect, straight or slightly curved, 5.5–12 cm long, 5–10 mm diam.; flowers (dried) rhombic, 1.6–1.7 mm long, 1.2–1.5 mm wide, the sides jaggedly sigmoid to straight; 8–11 flowers visible in principal spiral, 5–8 in alternate spiral; tepals semiglossy, minutely papillate, lateral tepals 0.7–0.8 mm wide, the inner margins erose, the outer margins 2–3-sided; pistils yellow-brown on drying, smooth, lacking raphide cells, rounded at apex, not at all protruding above the tepals; stigma linear, ca. 0.3 mm long; stamens emerging from near the middle, inclined over and obscuring pistil at anthesis, held against the pistil post anthesis; anthers 0.4–0.6 mm long, 0.4–0.5 mm wide; thecae obovoid-oblong, weakly divaricate. *Infructescence* erect to pendent; spathe persisting, green; spadix ca. (7.5)12–16 cm long, 1.5–2 cm diam.; berries red, obovoid, 7–8 mm long, 5 mm diam.; seeds 1–2 per berry, broadly oblong to rounded, flattened on one side, 4.4–5 mm long, 3–3.5 mm diam., 1.5–2 mm thick, with a transparent, gelatinous appendage at base and dark gelatinous appendage at apex.

A member of series *Multinervia*, *Anthurium fasciale* occurs in Morona-Santiago, Napo, Pastaza, and Tungurahua provinces in Ecuador, at 970–1,600 m in premontane moist and very wet premontane forest life zones.

This species is distinguished by its rather long cataphylls which quickly weather to pale fibers, its abaxially rounded and adaxially flattened or medially ribbed petioles with sharply raised margins, and its oblong leaf blades drying green or yellowish with the primary lateral veins rather numerous, but unequal in prominence and ascending at a broad angle from the midrib. Another distinctive feature is the dark red spadix with exserted stamens.

A collection which may belong here (*Croat 50586*), made from a cultivated plant reportedly collected south of Puyo on the road to Macas, differs in having stamens not exserted and a relatively shorter peduncle (0.4× as long as the petioles), but agrees well with *A. fasciale* in other characters, including pistil color (on drying).

The type specimen and another Sodiro collection closely resembling it are unusual in having peduncles 16–25 cm longer than any other specimens.

Anthurium fasciale is likely to be confused only with *A. penningtonii*, also from high elevations on the eastern slopes of the Andes and also a member of series *Multinervia*. *Anthurium penningtonii* differs in having more elliptic leaf blades with more numerous, sharply raised primary lateral veins, and a more slender spadix.

This species is also similar to *A. soukupii*, ranging from southern Ecuador to Bolivia. It shares similar leaf blades and a similar weakly tapered spadix. *Anthurium soukupii* occurs at a higher elevation (2,200 to 2,400 m) and also differs in having a more or less triangular petiole and fewer flowers per spiral (7 or less). In addition, the dark-drying pistils of that species are densely marked with raphide cells and have prominently exserted styles. In contrast, the pistils of *A. fasciale* dry yellow-brown, with no raphide cells visible and are broadly rounded at the apex with the stigmas not at all protruding.

ECUADOR: MORONA-SANTIAGO: Valle de Calagras, 11 km E of San Juan Bosco, Descanso, 1,600 m, 3°02'S, 78°21'W, *Dodson et al. 10495a* (SEL). NAPO: Holín-Loreto, Km 32, 8 km W of Guamaní, 1,200 m, 0°43'S, 77°38'W, *Neill et al. 8624* (MO). PASTAZA: cultivated S of Puyo, road to Macas, *Croat 50586* (MO, QCA); Río Negro, Baños, *Croat 50587* (MO, QCA); Puyo-Diez de Agosto and Arajuno, 8.2 km NE of Diez de Agosto, 970 m, 1°37'S, 77°51'W, *Croat 59017* (AAU, B, BM, CM, GH, K, M, MO, QCA, RSA, US); Puyo-Baños, 5.7 km W of Shell, 1,070 m, 1°26'S, 78°09'W, *Croat 59073* (MO, QCA); 2 km NE of Mera, Hacienda San Antonio de Baron von Humboldt, 1,100 m, 1°27′S, 78°06′W, *Palacios et al. 58* (MO); Mera, *Lugo 25* (S); Río Pastaza, Mera, *Lugo 1117* (GB); El Topo, 1,250 m, 1°25′S, 78°10′W, *Harling 3403* (S). TUNGURAHUA: Río Pastaza (Río Chambo), *Sodiro s.n., 8/1904* (G), *Sodiro s.n., 12/1906* (B).

Anthurium fatoense K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 11: 611. 1932. TYPE: Panama. Colón: Dos Bocas, Río Fato Valley, 40–80 m, *Pittier 4227* (holotype, US). Figures 134–136.

Epiphytic; stem 10–60 cm long, 1–2 cm diam.; leaf scars obscured by root mass; roots dense, ascending to descending, numerous, pale green to white, smooth to very pubescent, short to elongate, usually tapered, 1–4 mm diam.; cataphylls subcoriaceous to coriaceous, oblong-lanceolate, 5–14.5 cm long, acute at apex with a subapical apiculum, pale yellow-green, sometimes tinged with red, drying medium brown, persisting semi-intact, soon deciduous. *Leaves* erect to spreading; petioles 2.5–9.5 cm long, 5–8 mm diam., sharply quadrangular to angularly D-shaped to occasionally subterete, flattened to broadly sulcate adaxially, sharply 1–3-ribbed or sometimes rounded abaxially, the surface minutely pale-speckled; geniculum paler and thicker than petiole, 0.7–1(2) cm long; blades subcoriaceous, oblong-oblanceolate to oblanceolate to oblong-ovate, long-acuminate at apex, acute to obtuse to narrowly rounded at base, 24–83 cm long, 6–26 cm wide, broadest at or above the middle, the margins weakly and broadly undulate; upper surface matte to glossy, medium green, lower surface semiglossy to glossy, paler, drying greenish to greenish brown; midrib flat at base, becoming sharply and narrowly raised toward the apex above, raised and sharply 2-ribbed or prominently convex-raised at base below, becoming convex to flat toward the apex; primary lateral veins 8–16 per side, departing midrib at 40–50° angle, arcuate-ascending, narrowly raised above, less so and darker than surface below; interprimary veins less conspicuous than primary lateral veins; tertiary veins obscure above, darker than surface below; collective vein arising from near the apex or absent, 2–9 mm from margin. *Inflorescence* erect-spreading to arching-pendent, shorter than or equaling leaves; peduncle 14–48 cm long, 2–6(9)× as long as petioles, green to reddish, weakly striate, terete to subterete, faintly ribbed; spathe spreading to reflexed, subcoriaceous, light green, sometimes tinged with purple, narrowly lanceolate, 5.5–9(13.5) cm long, 0.7–1.3(2) cm wide, broadest near base, inserted at 45–90° angle on peduncle, long-acuminate at apex (the acumen inrolled), obtuse to subcordate at base; spadix green to green tinged with red to pale reddish to reddish violet or purplish, oblong-cylindroid to long-tapered, 5–15 cm long, 4–10 mm diam. near base, 2.5–4 mm diam. near apex; flowers rhombic to weakly 4-lobed, 1.4–2.8 mm long, 1.8–3 mm wide, the sides smooth to jaggedly sigmoid; 5–9 flowers visible in principal spiral, 5–12 in alternate spiral; tepals matte to weakly glossy, minutely and densely papillate and pale punctate; lateral tepals 1.2–1.5 mm wide, the inner margins straight to broadly convex, somewhat erose, the outer margins 2–4-sided; pistils prominently to weakly raised, weakly glossy, papillate, green to white; stigma 0.4–0.5 mm long, brushlike; stamens emerging in slow progression from the base in a complete sequence, the laterals preceding the alternates by 6–34 spirals, the 3rd stamen preceding the 4th by 1–12 spirals, arranged in a circle around pistil; filaments translucent, 0.5 mm long, 0.4 mm wide; anthers yellow to white, 0.5–0.6 mm long, 0.5–0.8 mm wide; thecae broadly to oblong-ovoid, not divaricate; pollen yellow fading to white, sweet-scented. *Infructescence* spreading; spadix to 26 cm long, with berries scattered throughout; berries cream to greenish yellow or pale orange, oblong-ovoid to ovoid-ellipsoid, acute at apex, 4–7.8 mm long, 3.3–4.2 mm diam.; pericarp thickened; seeds 2 per berry, pale yellow with numerous pale, granular raphide cells on the surface, oblong-ovoid, slightly or not at all flattened, 2.6–3 mm long, 1.5–1.8 mm diam., 1–1.3 mm thick, with a transparent, gelatinous, sticky appendage.

Anthurium fatoense is known from southern Costa Rica and Panama, occurring principally on the Caribbean slope in wetter parts of tropical moist forest, as well as in tropical wet, premontane wet, and lower montane wet forest, from sea level to nearly 1,200 m. It also occurs on the Pacific slope in the Fortuna area of Chiriquí Province in Panama.

Anthurium fatoense is considerably variable in size of the leaves and inflorescences as well as in berry color. It is distinguished by its slender, erect, pointed roots, short, conspicuously sheathed petioles, green-drying blades, and its tapered, greenish spadix with the stamens closely clustered over the pistil, the latter being not at all apparent.

This species is most easly confused with *A. consobrinum*, but that species has prominently emergent pistils that emerge well ahead of the stamens and extend several millimeters above the stamens.

COSTA RICA: ALAJUELA: Naranjo–Aguas Zarcas, 8.5 km NE of Villa Quesada Hwy. 15, 600 m, *Croat 46976* (MO); 2 km N of Santa Rosa, 15 km N of Boca Arenal on Quesada–Muelle San Carlos–Los Chiles road, 100 m, 10°38′N, 84°31′W, *Liesner et al. 15024* (MO). CARTAGO: cultivated, *Madison 6957* (MO, SEL). LIMÓN: 7 km W of Bribrí, 100–250 m, *Gomez et al. 20386* (CR, MO); 10 mi. S of Punta Cahuita, 3 mi. S of turnoff to Bribrí, 70 m, *Croat 43197* (MO); Cantón de Talamanca, Suretka, 9°34′N, 82°56′W, *Barringer et al. 3554* (MO); Caribbean Coast, between Río Bananito and Cahuita, 0–10 m, 9°53′N, 82°59′W, *Burger et al. 10485* (MO); Refugio Gandoca–Manzanillo, 0–5 m, 9°36′N, 82°36′W, *Grayum 8018* (MO); Hitoy Cerere reserve, Río Cerere, SW of Valle La Estrella, 1 km upstream from Quebrada Barrera, 90–200 m, 9°40.5′N, 83°02′W, *Grayum & Hammel 5787* (MO); Río Sizaola, between Limón and Shiroles, 6.5 mi. SW of Bribrí, 6 mi. SW of Bambú, 50 m, *Croat 43295* (MO). PUNTARENAS: Cantón de Coto Brus, 6 km W of San Vito de Java, 1,200 m, 8°49′N, 82°58′W, cultivated at Las Cruces Tropical Botanical Garden, *Croat 57229* (CR, MO). PANAMA: BOCAS DEL TORO: 15 km S of Changuinola, 300–500 m, *Antonio 3147* (MO); Cerro Banyic, above Quebrada Huron, 170–400 m, *Kirkbride & Duke 606* (MO); Fortuna Road, Changuinola–Luzon, *Kennedy 3266* (F, MO); Fortuna Lake--Chiriquí Grande, 1.2–8 km N of Continental Divide, 310–1,000 m, *Churchill et al. 4635, 4942* (MO), *Croat & Grayum 60121* (K, MO, RSA), *60171* (CM, MO), *60256* (MO, RSA), *60423* (B, K, MO, RSA, US), *Hampshire & Whitefoord 484* (BM); along road from Fortuna Dam toward Chiriquí Grande, 10 mi. from Continental Divide, 120 m, 8°55′N, 82°10′W, *McPherson 8587* (MO); Río Guarumo, Chiriquicito to 5 mi. S along Río Guarumo, *Lewis et al. 2051* (MO); Chiriquí Lagoon, Fish Creek Mts., *von Wedel 2350* (MO). CHIRIQUÍ: Fortuna Road, E of Fortuna, 1,200–1,600 m, *Folsom et al. 5293* (MO); between Gualaca and Fortuna Dam site, 5.9–11.8 mi. N of Los Planes de Hornito, 1,100–1,470 m, *Antonio 5175* (MO), *Croat 48705* (MO, F, DUKE, NY, RSA, S, US), *48716* (FTG, MO), *50095* (F, MO, TEX, W), *49893* (FTG, MISSA, MO), *Knapp & Vodicka 5517* (MO); vic. Fortuna Dam, N of the lake, 1,100 m, *McPherson 10407* (MO); along trail from Forestry Nursery to Río Hornito, 1,100–1,200 m, 8°45′N, 82°15′W, *Thompson 5029* (CM). COCLÉ: Cerro Tute, *Antonio 2055* (MO); Llano Grande–Coclecito, vic. Continental Divide, 400–600 m, *Antonio 1358, 3598* (MO), *Croat 49220* (MO), *D'Arcy & Sytsma 14690* (MO), *Hammel 1619* (MO), *3483* (MO, SEL), *Sytsma 3880* (MO, PMA); S of Cascajal, Continental Divide, 800–900 m, 8°45′N, 80°25′W, *Knapp 1961* (MO); 9–12 mi. from Llano Grande, 170–330 m, *Churchill et al. 3994, 4165* (MO), *Hammel 1808, 1908* (MO); El Copé Region, Alto Calvario, 600–800 m, *Folsom 3183* (MO); El Copé W of sawmill, *Hammel 2420, 2441* (MO); Continental Divide, sawmill above El Copé, 750–800 m, 8°40′N, 80°36′W, *Knapp & Dressler 3501* (B, MO); El Valle Region, El Valle de Antón, 2 km W of Cerro Pilón, vic. La Mesa, 860–900 m, *Croat 37347* (MO, SEL); El Valle de Antón, N of Cerro Gaital, vic. La Mesa, 700 m, *Hammel 3902* (MO). COLÓN: San Lucas, 100 m, *Hammel 4549* (MO); Cerro Bruja, S slope, Río Escandaloso, 200 m, *Hammel 3197* (MO); Portobelo Region, Río Escandaloso, abandoned Manganese mine, 170 m, *Hammel 2661* (MO, SEL); Río Cascajal, *Croat 33649* (MO, PMA); Río Guanche, E of Colón, W of Portobelo, 50 m, 9°30′N, 79°40′W, *McPherson 8513* (MO); Río Boqueron headwaters, fork with Río Nombre de Diosito, 170 m, *Hammel 3947* (MO); Río Tato, Dos Bocas, 40–80 m, *Pittier 4227* (US). VERAGUAS: trail from Barrera to gold mine "Cocuyo," 30–200 m, *Hammel 5192* (MO). Santa Fe Region, Cerro Tute, beyond Escuela Agrícola Alto Piedra, NW of Santa Fe, 900–1,250 m, *Antonio 2910, 4039* (MO), *Croat 48940* (MO), *Sytsma & Antonio 3049* (MO), *3068* (K, MO), *Sytsma & Andersson 4658* (MO); between Escuela Agrícola Alto Piedra and Río Dos Bocas, 350–770 m, *Croat 25941* (MO), *27365* (MO), *27583* (MO), *27749* (MO); 5.9 mi. N of Escuela Circlo Alto de Piedra, between Santa Fe and Río San Luis, 480 m, *Croat 66940* (MO); Río Primero Brazo, 5 mi. NW of Santa Fe, 700–1,200 m, *Croat 23115* (MO); 3.9–5 mi. N of Santa Fe, 500–1,000 m, *Folsom 2949* (MO, PMA), *Gentry 2953* (MO); 1–3 km N of Escuela Agrícola Alto de Piedra, N of Santa Fe, 900–1,250 m, *Mori & Kallunki 2560* (MO); 6–7 km W of Santa Fe, 970 m, *Nee 9807* (MO), *Nee 11220* (MO, PMA); between Santa Fe and Río Calovébora, 735 m, *Croat & Folsom 34124* (B, CAS, COL, CR, DUKE, F, MBM, MEXU, MO, NY, PMA, RSA, US), *Knapp & Sytsma 2623* (MO), *Hamilton & Krager 3965* (MO).

Anthurium fendleri Schott, Prodr. 468. 1860. TYPE: Venezuela. Colonia Tovar, *Fendler 1343* (lectotype, K; isolectotype, GH). Figures 137–139.

Anthurium recusatum Schott, Prodr. 467. 1860. TYPE: cultivated plant of unknown origin, illustrated by Schott, Aroideae 525–527, serves as the type.

Anthurium buenaventurae Engl., Bot. Jahrb. Syst. 25: 363. 1898. TYPE: Colombia. Valle: near Buenaventura, vic. Las Juntas near Dagua, 200–600 m, *Lehmann 5332* (holotype, B; isotype, F).

Anthurium canasas Croat, Aroideana 2(1): 30. 1979. TYPE: Panama. Veraguas: Dist. Cañasas, ca. 1 km above Cañasas on road to Los Valles, 230 m, *Croat 37051* (holotype, MO; isotypes, B, COL, F, PMA, S, SCZ, US).

Epilithic, epiphytic or terrestrial, on steep rocky banks; stem to 15 cm long, 1–3 cm diam.; roots moderately numerous, descending, greenish to brownish, densely pubescent, moderately elongate, tapered, 2–5 mm diam.; cataphylls moderately thin, broadly lanceolate, 5–10 cm long, acute with subapical apiculum at apex, yellowish red, heavily pale-speckled, drying brown, persisting semi-intact to fibrous, eventually deciduous. *Leaves* erect-spreading; petioles (2)4–47 cm long, 5–8 mm diam., D-shaped to subtriangular, narrowly to broadly sulcate adaxially, the margins sharply to bluntly raised, rounded to 1–5-ribbed abaxially, the surface medium green, pale-speckled; geniculum thicker and paler than petiole, becoming fissured transversely with age, (0.5)1–2.5 cm long; blades chartaceous to subcoriaceous, oblanceolate to broadly elliptic, gradually acuminate at apex, usually rounded or shallowly cordate, sometimes acute to obtuse at base, (15)30–81 cm long, (6)10–34 cm wide, broadest just above the middle, the margins broadly undulate; upper surface semiglossy, dark to medium green, lower surface weakly glossy to semiglossy, slightly paler; midrib flat at base, becoming convexly raised toward the apex above, slightly paler than surface, prominently higher than broad and acutely angular at base below, becoming convexly raised toward the apex; primary lateral veins 8–12 per side, arcuate-ascending, the lowermost free to the margin, loop-connecting to the collective vein in apical third, convexly raised, sometimes sunken in grooves above, prominently convex below; tertiary veins sunken above, raised and darker than surface below; reticulate veins obscure above, weakly visible below; collective vein arising from about the middle of the blade, sunken above, raised below, slightly less prominent than primary lateral veins, 4–12 mm from margin. *Inflorescences* spreading or stiffly erect; peduncle 30–79.5 cm long, 1.6–3.8 × as long as petiole, terete or weakly to prominently ribbed abaxially, sometimes also adaxially; spathe spreading and recurving or loosely coiled, caducous, thin, soon drying and weathering, green or green tinged with violet-purple (B & K purple 5/10), linear-lanceolate to narrowly triangular, 5.5–11.5 cm long, 0.9–2 cm wide, broadest near the base, inserted at 60–80° angle on peduncle, narrowly acuminate at apex, acute at base, the margins meeting at 40–50° angle; stipe green, 6–18 mm long; spadix maroon (B & K red-purple 2/10), long-tapered, 7.5–21 cm long, 4–7 mm diam. near base, 2.5–4 mm diam. near apex; flowers square to rhombic, 2.5–3 mm in both directions, the sides smoothly to jaggedly sigmoid; 4–8 flowers visible in principal spiral, 5–10 in alternate spiral; tepals matte, weakly punctate, densely and minutely papillate; lateral tepals 1.3–1.8 mm wide, the inner margins broadly convex, the outer margins 2–3-sided; pistils early emergent, 0.1–0.2 mm, green becoming violet-purple, sometimes green with violet-purple splotches; stigma ellipsoid, light purple-violet, 0.6 mm long, dry and full of slightly exserted bristles at anthesis, becoming dark and caviform, droplets conspicuous, appearing 2–4 days before stamens emerge; stamens emerging in a slow progression from the base, the laterals preceding the alternates by 3–5 spirals, the 3rd stamen preceding the 4th by 1–3 spirals, held just above tepals; anthers creamy to yellow, 0.4–0.5 mm long, 0.8–0.9 mm wide; thecae ovoid, not divaricate; pollen bright to pale yellow, soon fading to white. *Infructescence* pendent; berries violet-purple, obovoid, rounded at apex, 6.7–7 mm long; mesocarp thick, gelatinous, white; seeds 1–2 per berry, purplish, 4.5–5 mm long, 2–3.5 mm diam., 0.7–2 mm thick.

Anthurium fendleri ranges from sea level to usually less than 1,000 m, less frequently to 2,430 m, generally in partially shaded areas, in tropical dry, tropical moist, premontane wet, and premontane dry (presumably in premontane moist as well) forest life zones in Venezuela and Colombia. In Panama, it is rare and occurs in tropical moist forest.

Anthurium fendleri was previously known only from the Cordillera de La Costa of Venezuela west of Caracas, but is now known to range throughout most of western Colombia into the Serranía de Perijá in northeastern Colombia and western Venezuela, along the Río Meta in the state of Apure and southward along the eastern edge of the Andes to the Departments of Meta and Vichada, in southwestern Colombia. Disjunct populations include those in the Chocó, Colombia, in the Serranía del Darién, Panama, and in central Panama on the Pacific slope near Cañasas in Veraguas Province. Apart from *A. jenmanii*, *A. fendleri* appears to be the only species of sect. *Pachyneurium* that ranges from northern South America (well outside the Amazon Basin) to lowland Amazonia. While *A. jenmanii* achieves this by wrapping around the Guianas and into Amapá, Brazil, *A. fendleri* ranges south through Colombia, as outlined above.

This species differs from most members of the section by virtue of its thinner leaves and dark purple berries, and sometimes markedly rounded to subcordate leaf bases. It is further distinguished by its rich green, oblanceolate-elliptic to broadly elliptic leaves, which dry more or less olive-green and bicolorous, by its sunken tertiary veins, its ribbed petioles, thin, caducous spathe, slender reddish brown spadix, and violet-purple berries.

Anthurium fendleri is apparently most closely related to *A. bonplandii*, and some Colombian material may be confused with that species. *Anthurium bonplandii* differs in having leaves that dry brown and are usually conspicuously dark-glandular punctate and/or pustular (especially below) and acute at the base.

This species is variable in leaf size and shape and the base may vary from nearly acute to subcordate. Specimens from Apure in Venezuela seem to have somewhat more coriaceous leaf blades. *Croat 56578*, collected on rocky cliffs near the Río Claro in Antioquia, Colombia, has unusually coriaceous leaf blades. Another aberrant collection is *Stergios et al. 4568*, from Portuguesa, Venezuela, in Municipio de Ospino; it has leaf blades which are more coriaceous and less concolorous than usual, and obtuse-cuneate at the base. Other collections from the same area are from lower elevations, and have leaf blades that are more typically thinly coriaceous and bicolorous on drying, and conspicuously shallowly cordate at the base.

Though *A. recusatum* Schott was described from a cultivated plant of unknown origin, the Schott illustrations show it to be remarkably similar to *A. fendleri*, and it is here considered synonymous.

COLOMBIA. Río Magdalena, *Von Bayern 44* (BOG). ANTIOQUIA: Mpo. San Luis, Puerto Triunfo–Medellin; Río Claro, 51°54'N, 74°51'W, *Croat 56578* (CM, COL, DUKE, GH, INPA, JAUM, MO, MY, NY, P, PMA, QCA, SEL, US, VEN); N section of cañón of Río Claro, 325 m, 5°53'N, 74°39'W, *Cogollo 1342* (COL, MO); central section of canyon, 350–475 m, *Cogollo 615* (COL, MO), *1302* (COL, MO); Dabeiba, 1,350 m, *Backley & Guttierrez 1822* (COL). ATLÁNTICO: Barranquilla, *Elias 1477* (F); Sabana Larga, SSW of Barranquila, *Elias 1296* (COL, F, GH, US). BOLÍVAR: Juan Arias–San Pedro, *Castenada 9855* (COL). BOYACÁ: Río Casanare, Esmeralda, 130 m, *Cuatrecasas 3818* (US); CÉSAR: Río Magdalena, above Cañasas on road to Los Valles, Rincón Hondo, *Allen 285* (MO). CHOCÓ: Serranía del Daríen, W of Unguia, Río Tigre Base Camp, 300 m, *Gentry & Aguirre 15232* (MO, COL); Acandí, Bahía Zardí, 0–5 m, 8°24'N, 77°07'W, *Betancur et al. 1249* (MO). CUNDINAMARCA: Cascajal–Tabla Grande, Nocaima Region, 1,000 m, *Plowman et al. 5246* (COL). GUAJIRA: Sierra de San Antonio, Cuchilla de La Nueva, 300 m, 11°05'N, 73°30'W, *Cuadros & Gentry 2962* (MO). MAGDALENA: Río Frío–San Andrés de La Sierra, El Platanal, *Pittier 1697* (US); Santa Marta, 1,500 m, *Smith et al. 2305* (K), *2309* (BM, F, GH, MO, NY, US). META: 310 m, 2°96'N, 73°10'W, *Madison 1224* (GH); Villavicencio–Granada, N of Granada, 520 m, *Croat 55519* (MO); central mountains, Approach Ridge, 1,100 m, *Philipson & Idrobo 1900* (COL); Sierra de La Macarena, N escarpment, 800 m, *Philipson 2312* (COL); 850 m, *Idrobo 4866* (COL); NE end, Hda. Los Micos, Quebrada Honda, 460 m, *Plowman et al. 4210* (GJ, US). SAN ANTONIO: Sierra de Santa Marta, 1,000 m, Hanbury-Tracy 449 (K). SANTANDER: Río Surata Valley, Bucaramanga, 400–600 m, *Killip & Smith 16234* (GH, NY, US). SANTANDER SUR: Bucaramanga–Zapatoca, 5 km S of Girón, 660 m, 7°03'N, 73°12'W, *Croat 56545* (AAU, B, CAS, CM, COL, DUKE, K, M, MO, NY, RSA, SAR, SEL, UCLA, US); Río Carare–Río Magdalena, Puerto Berrio, 100–700 m, *Haught 1710* (US); Mpo. Florida Blanca, Verada Los Cauchos, S of Bucaramanga, 1,000 m, 7°01'N, 73°05'W, *Croat 56388* (CM, COL, K, L, MBM, MO, SAR, SEL, US, W). VALLE: Buenaventura, Las Juntas and Dagua, 200–600 m, *Lehmann 5332* (B, F); Cali–Buenaventura, Quebrada La Guinea, 1.2 km E of Cisneros, 220–260 m, 3°47'N, 76°46'W, *Croat 62821* (FT, IBE, MO); Río Dagua–Pepita, 302 m, *André 373* (K); Cordillera Occidental, La Cumbre, 1,700–2,100 m, *Pennell & Killip 5756* (NY). VICHADA: Cerro Rocoso, Territorio Faunístico del Tauparro, 100 m, *Vincelli 1201* (MO). PANAMA: VERAGUAS: above Cañasas on road to Los Valles, *Croat 37051* (B, CM, COL, DUKE, ENCB, F, K, KYO, MEXU, MO, NY, PMA, QCA, RSA, S, SAR, SCZ, TEX, VEN, US). VENEZUELA: Cultivated at Jardín Botánico de Ciudad Univ., *Braun 2* (VEN). APURE: Distrito Achaguas–Rómulo Gallegos, Río Capanaparo, Hato San Joaquin, 100 m, 6°48–52'N, 68°45–48'W, *Gragson & Gragson 92* (US). ARAGUA: Colonia Tovar, *Fendler 1341, 1343, 1344* (GH); Corgua, El Agricultor, *Trujillo 3833* (MY); Maracay, *Trujillo 4889* (MY), *Vogel 1175* (M); 500 m, *Bunting 2022C, 2022A* (NY); Parque Nacional Henri Pittier, 500–600 m, *Bunting 4788* (NY); Pozo del Diablo, *Fernández 270* (MY); Maracay–Ocumare, near Rancho Grande, 1,200 m, *Bunting 3393A* (NY). BARINAS: rd. to Barinas, NE of Santa Bárbara, 200 m, *Gentry & Puig-Ross 14271* (MO); Barinas–Mérida, N of Barinitas, along Hwy. 1, 450 m, *Croat 54754* (MO, VEN); between Barinitas–Altamira road and Calderas, 800 m, *Bunting 2263* (MY, NY). COJEDES: Ditto. El Limero, N of Tinaco, 100 m, *Delascio 4187* (VEN). FALCÓN: 440–1,200 m, *Liesner et al. 8283* (VEN). FALCÓN–LARA: Cerro Socopo, 500–1,000 m, *Liesner et al. 8432* (MO, NY, VEN), *8441* (MO, VEN). GUÁRICO: N of San Juan de los Morros at La Puerta, 380 m, *Bunting 2208* (NY). LARA: Dtto. Jiménez, Paso de Angosturo, 500 m, *Steyermark & Espinoza 107627* (MO, VEN); Dtto. Palavencino, Valle de el Altar, 250 m, *Steyermark et al. 109917* (F, VEN). MÉRIDA: Beguilla–Mucuchachi, 1,065–2,430 m, *Steyermark 56316* (F); El Vigia–Tovar, N of Santa Cruz de Mora, 450 m, *Croat 54878* (B, MO); Mérida–El Vigia, 650–850 m, *Bunting 2309A* (MY), *2744* (MY, NY), *2792* (MY); Río Caparo, ESE of Santa Bárbara, 100–250 m, *Liesner & González 9281* (MO). PORTUGUESA: ENE of Agua Blanca, NE Of Acrigua, 190 m, *Steyermark & Rabe 96474* (MO, VEN); NNE of Guanare, 1,450–1,520 m, *Steyermark et al. 126795* (MO, VEN); NE of Boca de Monte, NNE of Guanare, 400–500 m, *Steyermark et al. 127104* (MO, VEN). Río Saguas, border of Trujillo, El Amparo, 800–850 m, *Bunting 2294* (MY); Río Tucupido, S of Dam, WSW of Guanare by air, 100–200 m, *Liesner & González 12544, 12554* (MO); Dtto, Guanare, UNELLEZ property, 9°04'N, 69°49'W, *Aymard 1306* (MO); Mpo. Ospino, La Estación, 800–1,200 m, 9°25–27'N, 69°30–31'W, *Stergios et al. 4568* (MO). TACHIRÁ: La Fría–La Grita, 200–250 m, *Bunting 2487, 2508* (MY); Lobatera–Ureña, 1,216–1,250 m, *Bunting 2350* (MY); 13 km NW of Lobatera, *Bunting 2349* (NY); vic. San Cristóbal, 1,000 m, *Bunting 4369* (MO, NY); 925 m, *Bunting 4837* (NY); San Cristóbal–Barinas, 60 km E of San Cristóbal, 460 m, *Bunting 13020* (NY); San Cristóbal–Santo Domingo, 250–350 m, *Bunting 2384A, 2398* (MY, NY); 250 m, *Bunting 2399* (NY); 300–350 m, *Bunting 2384B* (NY); E of Ayari, 250 m, *Steyermark & Rabe 96659* (MO, VEN), *Steyermark et al. 119464* (MO, VEN); Río Frío, Junction of Río Quinimari–Río Frío, 480–500 m, *Steyermark & Liesner 119115* (MO, VEN); Río Negro, 450 m, *Liesner & Guarigila 11835* (MO, VEN); Sierra el Casadero, Las Dantas–Las Adjuntas, 850 m, *Steyermark et al. 120173* (B, CM, K, MO, VEN). TRUJILLO: Sabana de Mendoza–Valera, *Bunting 2825* (MY); Valera, *Pittier 10793* (US); 20 km NE of Agua Viva, E of Valerita, 150 m, *Bunting 2817* (NY). YARACUY: E of Salóm, W of Valencia, NE of Nirgua, 790 m, *Croat 54612* (BM, K, MO, VEN). ZULIA: Serranía de Perijá, Río Palmar, 450 m, *Chitty & Benkowski 3090* (VEN); Dtto. Bolívar, Piedras Blancas–El Río Chiquio, W of Embalse, 6.5 km N of Piedras Blancas, 75–125 m, *Bunting & Alfonso 8029* (NY); 20–25 km W of La Villa, 225–350 m, *Bunting et al.*

8799 (NY); Dtto. Colón, Casigua el Cubo, 150 m, *Bunting et al. 7241* (NY); on the outskirts of Casigua El Cubo, sector Los Manuels, 7–14 km N of Casigua, *Bunting et al. 7377* (NY); Dtto. Lagunillas, Serranía de Ziruma–El Empalado, 13 km N of Embalse, 550–600 m, *Bunting et al. 11279* (NY); Dtto. Mara, 400–530 m, *Steyermark et al. 122687A* (MO).

Anthurium galactospadix Croat, sp. nov. TYPE: Brazil. Acre: N bank of Rio Juruá, opposite Cruzeiro do Sul, *Prance et al. 2924* (holotype, INPA; isotypes, NY, US). Figures 140, 143, 193, 343, 344.

Planta epiphytica; internodia brevia, 2–3 cm diam.; cataphyllum lanceolatum, persistens semi-intactum; petiolus 11.5–28 cm longus, 5–10 mm diam., adaxile uninervis, abaxile rotundatus vel trinervis; lamina late oblanceato-elliptica, 51–92 cm longa, 18–34 cm lata; nervis primariis lateralis 7–14 utroque. Pedunculus (4)6–11 cm longus, 3.5–5 mm diam., 0.4–0.7-plo longiores quam petiolo; spatha late lanceolato-elliptica, (4.5)5.5–12 cm longa, 1.5–3.5 cm lata, viridis; spadix leviter contractus, 7.5–11 cm longus, 8–14 mm diam., eburnius. Baccae ignotae.

Epiphytic; stem 2–3 cm diam.; roots dense, short, 3–5 mm diam.; cataphylls coriaceous, lanceolate, 7–9 cm long, acute to emarginate at apex, drying reddish brown, persisting semi-intact as a reticulum of fibers, splitting at apex. *Leaves* erect-spreading; petioles 11.5–28 cm long, 5–10 mm diam., D-shaped, with a prominent medial rib and sharply raised margins adaxially, rounded to 3-ribbed abaxially; geniculum shaped like and slightly thicker than petiole, 0.5–2 cm long; sheath 2.5–6.5 cm long; blades coriaceous to subcoriaceous, broadly oblanceolate-elliptic, acute to acuminate at apex, often attenuate with concave margins to long-acute to obtuse at base, 51–92 cm long, 18–34 cm wide, broadest above the middle, the margins moderately to strongly undulate; midrib sharply raised above, 3-ribbed near the base, becoming obtuse to acute below; primary lateral veins 7–14 per side, departing midrib at 40–50° angle, ascending straight or arcuate to the margin, acutely raised above, convexly raised below; interprimary veins absent except toward base and apex; tertiary veins obscure above, flat and darker than surface below, prominulous on both surfaces on drying; reticulate veins obscure; collective vein absent. *Inflorescences* erect; peduncle (4)6–11 cm long, 3.5–5 mm diam., 0.4–0.7× as long as petiole, terete; spathe usually erect to erect-spreading, sometimes reflexed, coriaceous, dark green to greenish white, broadly lanceolate-elliptic, flattened to navicular, (4.5)5.5–12 cm long, 1.5–3.5 cm wide, broadest at or near the middle, obtuse at apex (the acumen apiculate), acute at base, sometimes decurrent for up to ca. 1 cm; spadix pale green to creamy white, sessile, scarcely tapered, erect, slightly curved, (4)7.5–11 cm long, 8–14 mm diam. midway, 7–8 mm diam. near apex; flowers square, 1.1–1.9 mm long, 1.1–1.8 mm wide, the sides mostly straight parallel to spirals, jaggedly sigmoid perpendicular to spirals; 13–25 flowers visible in principal spiral, 15–28 in alternate spiral; tepals matte, smooth or covered with a waxy layer or minutely papillate; lateral tepals 0.5–0.8 mm, the inner margins rounded, weakly turned up against the pistil, the outer margins 2-sided; pistils emergent before stamens appear, square, ca. 1 mm in both directions, pale purplish lavender when fresh, colored ± like the tepals when dried; stigma 0.5 mm long, slitlike when young, becoming brushlike; stamens emerging somewhat sporadically from near the base, the laterals emerging to the apex before the first alternates appear, held erect on drying; anthers 0.4–0.6 mm long, 0.4–0.5 mm wide; thecae oblong-ellipsoid, not divaricate. *Infructescence* erect; spathe persisting; spadix (4)6–13 cm long, 0.8–1.7 cm diam.; mature fruits unknown.

Anthurium galactospadix is restricted to the western Amazon basin in "Trapecio Amazonico" in extreme southeastern Colombia, east-central Loreto near the Brazilian border in Peru, and in Acre and southern Amazonas in Brazil. It comprises epiphytes in tropical wet and tropical moist forest life zones (at least in Peru and Colombia), at 300 m or less.

This species is readily distinguished by its thick, relatively short, whitish spadix with the spathe usually longer than the spadix, its short peduncle, and its broadly elliptic-oblanceolate blades which are often attenuate with conspicuously concave margins toward the base. It is most closely related to *A. ernestii*, which differs in having usually thin, straw-colored cataphylls that perisist intact as fine reticulate fibers (vs. semi-intact with more coarse fibers), a shorter and narrower spathe and much less stout spadix which is variously colored but never whitish, and in usually having somewhat orange primary lateral veins upon drying (especially on the lower surface). In addition, the spadix of *A. ernestii* always surpasses the spathe, while in the present species it is shorter than the spathe. The specific epiphet for this species comes from "galacto-" (Greek), meaning milky white, alluding to the color of the spadix.

Two collections from Acre in Brazil (*Cid & Nelson 2563* and *Prance et al. 7471*) are tentatively placed here. They differ in having a stem only 1–1.5 cm diam., leaf blades 43–76 cm long, and 11–20 cm wide, a peduncle 0.2–0.5 × the length of the petiole, a spathe 4.5–6.5 cm long, 1.5–1.7 cm wide, and a spadix 3.1–5 cm long and 4–7 mm diam. In addition, the Prance et al. collection reports the spadix color as brown, and in the Cid & Nelson collection the peduncle equals the petiole in length. Another aberrant specimen is *Tessmann 5463*, from Yarina Cocha in Loreto, Peru, which has a more slender spadix and a spathe more than twice as long as the spadix. All of the above are probably aberrant specimens rather than representatives of distinct taxa.

BRAZIL: ACRE: Cruzeiro do Sul–Rio Branco, 44 km E of Cruzeiro do Sul, Fazenda da Dona Cabuca, 150 m, 7°38′S, 72°35′W, *Croat 62329* (INPA, MO); Sena Madureira–Rio Branco, Km 5.5, 140 m, 9°04′S, 68°39′W, *Croat & Rosas 62721* (CAS, IPA, K, MO, NY, US); Rio Acre, Seringal de São Francisco, *Ule 9206* (K, MG); Rio Moa, Cruzeiro do Sul, 150 m, 7°37′S, 72°37′W, *Croat & Rosas 62305* (AAU, F, INPA, MO); Mpo. Canamari Amazonas, Rio Jurua, opposite Cruzeiro do Sul, *Prance et al. 2924* (INPA, NY, US); 1 km upstream from Floresta, 150 m, 7°37′S, 72°36′W, *Croat 62533* (INPA, MO); Mpo. Cruzeiro do Sul, Cruzeiro do Sul–Rio Branco, vic. INCRA headquarters, 160 m, 7°38′S, 72°35′W, *Croat 62633* (INPA, MO); Mpo. Sena Madureira, Sena Madureira, *Cid & Nelson 2563* (INPA); Sena Madureira–Rio Branco, Km 7, *Prance et al. 7659* (NY, INPA); Mpo. Tarauaca, Tarauaca, 8°08′S, 70°50′W, *Prance et al. 7471* (NY, INPA, US). AMAZONAS: Mpo. Labrea, Rio Purus, 5 km above Labrea, *Prance et al. 8126* (NY, INPA). COLOMBIA: AMAZONAS: Río Loretoyacu: NW of Leticia, *Schultes & Black 8527* (COL, US). PERU. LORETO: Yarina Cocha, Pucallpa, *Tessmann 5463* (NY); Prov. Coronel Portillo, Río Abujao, Caserío de J.C. Mariategui–Mejico, one hour by boat from Caserío de Abujao, 300 m, 8°15′S, 73°45′W, *Diaz et al. 753* (MO).

Anthurium glaucospadix Croat, sp. nov. TYPE: Colombia. Cundinamarca: along road between Tena and La Mesa, 6 km NE of La Mesa, 1,300 m, 4°39′N, 74°26′W, *Croat 55257* (holotype, MO 3033409; isotypes, B, CAS, COL, F, GH, K, MBM, NY, RSA, SEL, US; live at MO). Figures 141, 142, 144, 145, 151.

Planta terrestris aut epiphytica; internodia brevia, 3–5(6) cm diam.; cataphyllum lanceolatum aut late lanceolata; petiolus 4–26(63) cm longus, 4–13 mm diam., acute D-formatus vel C-formatus aut plus minusve subquadrangularis, adaxile complanatus aut sulcatus, abaxile rotundatus aut 3–5(8) costatus; lamina 30–110 cm longa, (8)15–38 cm lata, plerumque oblanceolata, apica plerumque rotundato; nervis primariis lateralibus (7)9–18 utroque; pedunculus 30–60(90) cm longus, 3–10 mm diam.; spatha oblongo-lanceolata, purpureo-violacea aut viridis, (6)10–32 cm longa, (1)2–3.5 cm lata; spadix glaucus, caeruleo-viridis, longus et graduatim contractus, (7.5)14–33 cm longus, 5–12 mm diam. Baccae rubrae, oblongae, apice quadrato.

Terrestrial or epiphytic; stem to ca. 30 cm long, 3–5(6) cm diam.; roots dense, ascending, grayish white to pale green, soft, fuzzy, heavily woolly-pubescent, short, tapered, less than 10 cm long, 3–6 mm diam.; cataphylls subcoriaceous, lanceolate to broadly lanceolate, 3–12 cm long, acute to prominently emarginate at apex, green tinged with red, drying tan to reddish brown, persisting as a reticulum of fibers. *Leaves* semi-erect to spreading, occasionally pendent; petioles 4–26(63) cm long, 4–13 mm diam., sharply D-shaped or C-shaped to ± quadrangular, flattened to sulcate, often with a medial rib adaxially, the margins acutely raised, rounded to 3–5(8)-ribbed abaxially, the surface short-lineate, sometimes pinkish at base; geniculum slightly paler and thicker than petiole, becoming minutely fissured and scurfy adaxially, 1–3.5 cm long; sheath 3–7 cm long; blades moderately coriaceous, mostly oblanceolate, sometimes elliptic or oblong-oblanceolate, mostly rounded or rounded-emarginate on larger leaves, acute to slightly acuminate on smaller leaves at apex (the acumen inrolled, apiculate, sometimes inequilateral, downturned), mostly attenuate or acute (rarely rounded to obtuse) at base, 30–126 cm long, (8)15–47 cm wide, broadest in upper third, the margins slightly to moderately undulate; upper surface glossy to semiglossy or weakly glossy, medium green or yellow-green, lower surface semiglossy or occasionally matte, slightly paler, sometimes weakly to conspicuously whitish glaucescent; midrib flat at base, becoming obtusely to acutely raised toward the apex above, prominently obtuse-raised to 3–6-ribbed at base, becoming prominently convex toward the apex below, paler than surface above and below; primary lateral veins (7)9–18 per side, departing midrib at (30)50–70(80)° angle, weakly arcuate-ascending to the margin, sometimes appearing sinuate, convexly raised above, prominently convexly raised below, paler than surface; interprimary veins few, scarcely visible, sunken above, weakly raised below; tertiary veins weakly sunken or weakly raised above, prominently raised below; collective vein arising from near the apex, occasionally in the lower third (especially in smaller plants), sunken above, raised below, 3–9 mm from margin. *Inflorescences* semi-erect to spreading or pendent, shorter than, or almost equaling leaves; peduncle 30–60(98) cm long, 3–10 mm diam., 2–7 × as long as petioles, green weakly tinged with red, pale short-lineate, terete to subterete, occasionally ribbed abaxially; spathe spreading to reflexed, sometimes twisted, occasionally with prominently revolute margins, subcoriaceous, matte above and below, green to green heavily tinged with red or purple-violet (especially on adaxial surface), oblong-lanceolate to oblong-triangular, (6)10–32(55) cm long, (1)2–3.5(4.0) cm wide, broadest near the base, inserted at 20–35° angle on peduncle, long-acuminate to abruptly short-acuminate at apex (the acumen often inrolled, 15–20 mm long), acute or decurrent to 6.5 cm at base; stipe rarely to 14 mm; spadix glaucous, bluish green, sometimes weakly tinged with purple or yellow, very long-tapered, ± erect to pendent and curved upward, (7.5)14–33 cm long, 5–12 mm diam. near base, 3–4 mm diam. near apex, broadest at the base; flowers rhombic, (1.6)1.8–3 mm long, (1)1.4–2.6 mm wide, the sides straight to jaggedly sigmoid; (5)6–9 flowers visible in principal spiral, 8--13 in alternate spiral; tepals glaucous, matte, minutely papillate, with a few scattered droplets, lateral tepals 1–1.6 mm wide, the inner margins broadly convex to straight, the outer margins ± straight or bluntly angled to obtusely 3-sided; pistils emergent, papillate, matte, squarish, pale green; stigma ellipsoid becoming circular, 0.4–0.6 mm long; stamens emerging rapidly in a regular and complete sequence over a 5–6-day period, the laterals preceding the alternates by (3)10–14 spirals, the 3rd stamen preceding the 4th by 1–3 spirals, inclined over and obscuring pistil; anthers pale yellow, 0.2–0.8 (dried) to 1 (fresh) mm long, 0.4–0.9 mm wide when fresh; thecae oblong, not divaricate; pollen pale yellow fading to cream, sweetly scented like rotting fruit. *Infructescence* with spathe persisting; spadix 12–53 cm long, 1.5–3.5 cm diam.; berries reddish purple, obovoid to oblong, 7–12 mm long, 4–5.5 mm diam.; pericarp thin, with raphide cells; mesocarp gelatinous; seeds 1–2 per berry, oblong, 4–5 mm long, 1.6–2.2 mm diam., 1–1.2 mm thick, with a mucilaginous appendage.

Anthurium glaucospadix is endemic to Colombia in the departments of Risaralda, Santander, Santander Sur, Cundinamarca, Valle and Huila, from 500 to 2,100 m. The distribution is unusual in that it included both slopes of the Cordillera Occidental (but only an unusually dry region of the Pacific slope). *Anthurium glaucospadix* is terrestrial or epiphytic on dry, rocky, steep slopes, exposed areas and thickets or as an understory herb in disturbed forest in premontane moist and premontane wet forest life zones.

This species is recognized by its long-tapered, bluish green, glaucous spadix (hence the name), its distinctive, usually emarginate or apically rounded blade, and by its reddish purple fruits.

This species is most closely related to *A. caucavallense*, also from Colombia, which differs by having a nonglaucous spadix, hooked cataphylls, more acute blade apices and more broadly spreading primary lateral veins.

Worthy of mention is *Triana 683/1702*, a mixed collection, two sheets of which are mounted with the leaves of a dicotyledonous plant, apparently of the Lecythidaceae. Although this number was recorded as being from Cundimarca, *Triana 682* is from Pasto.

COLOMBIA. CUNDINAMARCA: Fusagasuga–Girardot, km 63, 7 km S of Fusagasuga, 1,520 m, 4°25'N, 74°25'W, *Croat 52000* (AAU, B, CAS, CM, COL, G, JAUM, K, M, MEXU, MO, NY, QCA, SAR, US), *55428* (K, MO, NY, US); Fusagasuga–Melgar, 4 km SW of Fusagasuga, 1,525 m, *Barclay et al. 3645* (US); Mosquera–La Mesa, km 32, Laguna Pedro Palo above Finca San José, 2,000–2,250 m, *Gentry & Fallen 17159* (COL, MO); Tena–La Mesa, 6 km NE of La Mesa, 1,300 m, 4°39'N, 74°26'W, *Croat 55257* (B, CAS, COL, CM, DUKE, ENCB, F, GH, K, MBM, MO, NY, OOM, QCA, RSA, SAR, SEL, TEX, VBD, US, Z); Anolaima, 1,800 m, *Daniel & Augusto 4567* (COL); 6 km from La Mesa, 1,470 m, *Forero & Garzón 307* (COL); Quebrada Blanca, Choachi–La Calera, 1,900 m, *Acosta-Arteaga 25* (COL, MO); Quebrada Cabaña, Tocaima–Pubenza, 380–600 m, *Killip et al. 38371* (COL, US); Río Bogotá, above Apulo (Rafael Reyes), 2,100 m, *Plowman & Davis 3760* (COL); Santandercito, bridge over river, 1,600 m, *Silva Mojica 404* (COL); Anapoima, WSW of Bogota, 2,000 m, *Triana 683/1702* (BM, COL, P, US); Mpo. Tena, Lago Pedro Palo, 3 km N of Tena, 2,080 m, *Fernández & Mora 1445* (COL). HUILA: Cordillera Oriental, E of Neiva, 1,300–1,800 m, *Rusby & Pennell 998* (NY); 0.5 km above Vegalarge, 1,300 m, *Croat 55274* (MO); San Augustín, 1,500 m, *Bogner 846* (cultivated) (K). META: Cordillera Oriental, *Dryander 2154* (US). PASTO: 2,200 m, *Triana 682* (US). RISARALDA: along road between Pueblo Rico and Istmina, 14 km NW of Pueblo Rico, 5°03'N, 76°00'W, 780 m, *Croat 70848* (MO). SANTANDER: 0.5 km S of Berveo, 15 km NW of Velez, 2,000–2,500 m, *Fassett 25107* (MO, US). SANTANDER SUR: Mpo. Florida, cultivated at Jardín Botánico "Eloy Venezuela," 880 m, 7°05'N, 73°07'W, *Croat 56546* (MO). VALLE: Buga–Buenaventura: near Lago Calima, 1,430 m, 3°54'N, 76°33'W, *Croat 56747* (COL, MO); Km 44, Vereda El Trapiche, 1,140 m, 3°48'N, 76°37'W, *Croat 56753* (CM, COL, JAUM, MO, QCA, U, US); Cali–Buenaventura, NW of Loboguerrero at km 58.8, W of Cali, 575 m, 3°42'N, 76°39'W, *Croat 57518A* (MO), *57519* (COL, F, JAUM, MO, P, QCA, US, WIS); Cisneros, 300–500 m, *Killip 35595* (COL, F, US); Dagua, 700–900 m, *Killip 5441* (GH, NY, US), *5442* (NY); 1,200 m, *Heredia & Alvaré 369* (MO); Mun. Restrepo, along Río Grande between Pavas and Restrepo, 1,000 m, *Ramos & Reyna 908* (CUVC, F, MO).

Anthurium guanchezii Bunting, Phytologia 60(5): 294–295, fig 3. 1986. TYPE: Venezuela, Amazonas: Dpt. Atures, Caño Cabeza de Monteco, affluent of Río Autana, 110–120 m, 4°52′N, 67°27′W, *Guanchez & Melgueiro 3451* (holotype, VEN; isotype, VZM).

Terrestrial; internodes short, drying 2.5 cm diam.; cataphylls persisting semi-intact; petioles 30 cm long, sheathing 1.7 cm at the base, cross-sectional shape not known; geniculum 0.8–1 cm long, remote from the blade base by 4.5 cm; blades pergamentaceous to subcoriaceous, broadly ovate, gradually acuminate at apex (the acumen 25 mm long), weakly cordate at base, 33.5 cm long, 22.5 cm wide; sinus 1.8 cm deep; the lower surface brown-punctate; the lower naked portion of midrib subterete and narrowly sulcate; posterior rib naked 1.5–2 cm; primary lateral veins ca. 8 per side, slender, departing midrib at ca. 40° angle, the lower 2–3 pairs at broader angle, arcuate-ascending to the margin; collective vein lacking or arising only in the upper fourth of the blade. *Inflorescences* slightly longer than leaves; peduncle 58 cm long; spathe reflexed-recurved, narrowly ovate, 9 cm long, 2.5 cm wide, acuminate at apex, decurrent 1.2 cm at base; stipe 1.7 cm long in front, 4 mm long in back; spadix weakly tapered, 8.2 cm long (apex missing), 7 mm diam. at anthesis, to 1.1 cm diam. in pre-fruiting condition. *Infructescence* not known.

Anthurium guanchezii is endemic to Venezuela and known only from the type locality at 110 to 120 m in a region which lies near the boundary between the tropical moist forest and premontane wet forest life zones.

The description given here is based only on the original type description and the species is therefore imperfectly known. Still, there is little doubt that *A. guanchezii* is a member of sect. *Pachyneurium* and is probably most closely related to *A. iramirezae*, which is also glandular-punctate, but differs in lacking a remote geniculum and in having a cartilaginous rather than a subcoriceous blade with basal veins not naked at the sinus. In addition, *A. iramirezae* has a narrower spathe, a sessile spadix and occurs at 1,350 m on granite outcrops.

Anthurium guanchezii is also related to *A. bonplandii* because of its glandular-punctations. It is easily distinguished from any of the varieties of that species by its ovate blades with a remote geniculum. While some specimens of *A. bonplandii* subsp. *bonplandii* have a remote geniculum, none have such ovate blades.

VENEZUELA: AMAZONAS: Dept. Atures, Caño Cabeza de Manteco, affluent of Río Autana, "Manteco" rapids, 110–120 m, 4°52′N, 67°27′W, *Guanchez & Melgueiro 3451* (VEN, VZM).

Anthurium halmoorei Croat, Ann. Missouri Bot. Gard. 70(2): 301. 1983. TYPE: Mexico. Nayarit: along Hwy. 28 between Tepíc and Jalcocotán at Km 15.5, ca. 1,000 m, *Croat 45337* (holotype, MO 2690192-193; isotypes, CAS, K, MEXU, MICH, SEL). Figures 146, 147, 152.

Epiphytic or epilithic; stem 1.5–5 cm diam.; roots dense, spreading to descending, tan to greenish, smooth, short, and stubby, 7–10 mm diam.; cataphylls coriaceous, lanceolate, (5)17–23 cm long, acute and apiculate at apex, green, sometimes reddish, drying tan to brown, persisting with apex remaining intact, dilacerating at base. *Leaves* erect to spreading; petioles 15–26 cm long, 7–18 mm diam., D-shaped to thicker than broad, broadly sulcate adaxially with the margins sharply raised to obtuse, sharply 1-ribbed to obscurely 3-ribbed or rounded abaxially, the surface pale-speckled; geniculum paler and thicker than petiole, 1–2.5 cm long; blades coriaceous, oblanceolate to oblanceolate–elliptic, short-acuminate at apex (the acumen shortly apiculate), acute to attenuate at base, 32–108 cm long, 10–43 cm wide, broadest above the middle, the margins prominently undulate; upper surface semiglossy, medium green, lower surface semiglossy to matte, much paler; midrib flat to obtusely angular at base, becoming narrowly acute and then flat toward the apex above, prominently higher than broad and 1-ribbed at base, becoming convexly raised toward the apex; primary lateral veins 5–14 per side, departing midrib at 40–55° angle, straight then arcuate-ascending to the margin, convexly raised, much paler than surface above, prominently raised and paler than surface below; interprimary veins less conspicuously raised above, visible and flat below; tertiary veins obscure above, darker than surface below; collective vein arising from near the apex or absent, flat to weakly sunken above, weakly raised and darker than surface below, 6–11 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 32–43 cm long, 9–10 mm diam., 2–2.5 × as long as petiole, subterete, obscurely angled; spathe spreading, subcoriaceous, green, sometimes tinged with purple (B & K yellow-green 6/10), ovate to broadly ovate, 13–16 cm long, 6.2–9.7 cm wide, broadest near the base, inserted at 70° angle on peduncle, acuminate at apex, acute at base; spadix green, purple or green heavily tinged with purple (B & K red-purple 2/5), cylindroid, 9–21 cm long, 11–27 mm diam. near base, 5–7 mm diam. near apex; flowers 4-lobed, 2.4–2.8 mm long, 2.7–3.2 mm wide, the sides sigmoid; 8–14 flowers visible in principal spiral, 12–20 in alternate spiral; tepals matte, weakly punctate, minutely papillate; lateral tepals 1.5–1.8 mm wide, the inner margins convex; pistils slightly raised, green, tinged with purple in the area of stigma; stigma linear, 0.4–0.6 mm long, droplets appearing 4–5 days before stamens emerge; stamens emerging ± rapidly from the base, inclined over the pistil; filaments exserted, ca. 0.3 mm long, 0.8 mm wide; anthers orange; thecae ellipsoid, scarcely divaricate; pollen orange, fading to white (B & K yellow 7/2.5). *Infructescence* 20–23 cm long, 3 cm diam., pendent; spathe usually persisting, green; berries pale yellow, greenish at tip, irregularly obovoid, 12–15 mm long, 7–9 mm diam.; mesocarp fleshy, with numerous raphide cells; seeds 2 per berry, pale tan, subglobose, weakly flattened, 5–6.5 mm long, 3.5–4.1 mm diam., ca. 2.5 mm thick, with a sticky appendage at both ends.

Anthurium halmoorei is restricted to western Mexico in the states of Nayarit, Jalisco, and Michoacán in seasonally very dry forests from 450 m to 1,000 m. It usually occurs on rocks on very steep slopes in forested areas.

This species is characterized by its generally oblanceolate or oblanceolate-elliptic blades with usually free-ending primary lateral veins; by its petiole which is acute abaxially; and especially by its ovate to ovate-elliptic spathe, green to purplish spadix, and greenish yellow mature berries.

Anthurium halmoorei is most easily confused with *A. schlechtendalii* subsp. *jimenezii*, which differs in having the petiole subquadrangular and usually flat abaxially, and in having a lanceolate spathe and red berries at maturity. The latter taxon occurs only in Guerrero and southern Oaxaca.

MEXICO: MICHOACÁN: Aguililla, *McVaugh 24741* (MICH); Coalcomán de Matamoros, *Rzedowski 16707* (ENCB, MICH). NAYARIT: Tepic–Jalcocotán, at Km 15.5, Hwy. 28, 1,000 m, *Croat 45337* (CAS, F, K, MEXU, MICH, MO, SEL, WIS); E of Tepic–Navarrete road, Barranca, NW of Tepic, *Dressler 339* (MO, UC); Jalcocotán, *Gentry & Gilly 10734* (MEXU, US), *McVaugh 12140* (MICH), *Moore & Bunting 8692* (BH); 4 km SE of Pochotitán, 1,000 m, 21°37'N, 104°41'W, *Miller & Téllez 3163* (B, MO); Mirador El Águila, *McVaugh 15281* (MICH); NE of Santa María de Oro, *Feddema 703* (MICH); vic. Tepic, *Bates et al. 1554* (BH), *Dressler 1024* (UC), *Ferris 6816* (DS), *Lewis s.n.* (MICH). JALISCO: Mpo. Jalisco, El Tuito–Puerto Vallarta, *Anderson 6113* (ENCB, MICH); 3 mi. N of El Refilon on road to Tepic, *Norris & Taranto 12645* (CAS, MO); Autlán de Navarro, *McVaugh 10224* (MICH), *Wilbur 2289* (MICH); El Tuito–Puerto Vallarta, *Delgado 359* (MICH), *Hernández 2608* (MEXU); S of San Pedro, *Koeppen & Iltis 593* (BH); Talpa de Allende, *McVaugh 23408* (MICH).

Anthurium hammelii Croat, Monogr. Syst. Bot. Missouri Bot. Gard. 14: 109. 1986. TYPE: Panama. Bocas del Toro: 5 km ENE of Cerro Pate Macho, near Finca Serrano, NE of Boquete, 1,675 m, *Hammel 6160* (holotype, MO 2802252). Figures 148, 153.

Description based on dried material only. Epiphytic; stem 1 cm diam.; cataphylls subcoriaceous, 6 cm long, brown, persisting semi-intact; petioles 33–34 cm long, 4 mm diam., apparently subterete; geniculum 1 cm long; blades subcoriaceous, oblong to oblong-elliptic, acuminate at apex (the acumen flat, 15–20 mm long), obtuse at base, 30–31 cm long, 5.5–7 cm wide, broadest at or near middle, the margins weakly undulate; midrib convexly raised above, more prominently so below; primary lateral veins 9–11 per side, departing midrib at 60° angle, arcuate to the collective vein, raised above and below; interprimary veins few, almost as conspicuous as primary lateral veins; tertiary veins prominulous above and below; collective vein arising from the base, less prominent than primary lateral veins, 2–4 mm from margin. *Inflorescences* erect, shorter than leaves; peduncle 28 cm long, 3 mm diam., slightly shorter than petiole, terete; spathe subcoriaceous, dark reddish purple, ovate-rounded, 8.5 cm long, 7 cm wide, broadest at or near middle, the apex round and minutely apiculate, the base cordate; stipe 1 cm long in front and back; spadix cream, cylindroid-ellipsoid, 2.1 cm long, 8 mm diam. midway, broadest at the middle; flowers rhombic, 1.5–2.4 mm long, 2–2.5 mm wide; 5–7 flowers visible in principal spiral; lateral tepals 1–1.5 mm wide, the inner margins rounded; pistils not emergent; stamens emerging well above tepals, then retracting to level of tepals, held in tight cluster above pistil; anthers 0.6 mm long, 0.6 mm wide; theca ovoid, scarcely divaricate. *Infructescence* not seen.

Anthurium hammelii is known only from the type collection made in Bocas del Toro, Panama, at 1,675 m in lower montane rainforest.

This species is distinguished by its leaves with the petiole longer than the blade, its oblong-elliptic blades, its large, ovate-rounded spathe, and cylindroid-ellipsoid, cream-colored spadix.

Anthurium hammelii is similar in overall appearance to *A. protensum* subsp. *arcuatum*, which differs in having proportionately shorter petioles, a much narrower spathe, and a more elongate, tapered spadix.

PANAMA. BOCAS DEL TORO: ENE of Cerro Pate Macho, near Finca Serrano, NE of Boquete, 1,675 m, *Hammel 6160* (MO).

Anthurium harlingianum Croat, sp. nov. TYPE: Ecuador. Napo: between Lago Agrio and Baeza at Río Oyocachi, 1,620 m, 0°20'S, 77°55'W, *Croat 50290* (holotype, MO 2819231-32; isotypes, K, NY, QCA, RSA, USM). Figures 7, 16, 149, 150, 154, 155.

Planta epiphytica; internodia brevia, 3–5(6) cm diam.; cataphyllum lanceolatum unciformie vel cucculato, persistens semi-intactum; petiolus 4.5–13 cm longus, 7–15 mm diam., adaxile uninervis, abaxile trinervis-quinquenervis; lamina (32)50–90(150) cm longa, 18–40(60) cm lata, oblongo-oblanceata; nervis primariis lateralibus 12–23 utroque. Pedunculus 21–50(100) cm longus, 3–6 mm diam.; spatha lanceolata, viridis usque ad marroninam, 6.5–22(40) cm longa, 1.5–4.5 cm lata; spadix erectus, purpureus pallescens usque ad atrasalmaneus, contractus, 10–25(47) cm longus, 4–7 mm diam. Baccae albae usque ad purpureae, oblongae, 7–8 mm longae.

Epiphytic; stem to 30 cm long; internodes short, 2.5–5(6) cm diam.; roots dense, ascending to spreading, whitish to green-gray, velutinous, to ca. 13 cm long, 3–6 mm diam.; cataphylls lanceolate and hook-shaped or cucullate, less often straight, subcoriaceous, short, to 7 cm long, persisting semi-intact. *Leaves* erect-spreading; petioles 4.5–13 cm long, 7–15 mm diam., D-shaped, obtusely angled with a medial rib adaxially, rounded to 3–5-ribbed abaxially; geniculum paler and moderately thicker than petiole, 1–2.5 cm long; sheath 2–10 cm long; blades coriaceous to subcoriaceous, broadly oblong-oblanceolate to ± elliptic, acute at apex, shallowly cordate to truncate, rarely acute to narrowly acute at base (usually in younger plants), (32)50–90(150) cm long, 18–40(60) cm wide, broadest above the middle, the margins broadly undulate; upper surface weakly glossy to matte, medium green, lower surface matte, slightly paler; midrib above obtusely raised at base, becoming acutely raised toward the apex, rounded to obtusely angled below; primary lateral veins 12–23 per side, departing midrib at 30–60° angle, ascending straight to the margin, becoming arcuate near the margin, convexly to acutely raised above, convexly raised below, slightly paler than surface above and below; tertiary veins prominulous and darker than surface below; collective vein arising from about the middle of the blade (more often absent), prominulous, 3–10 mm from margin. *Inflorescences* erect-spreading, shorter than leaves; peduncle 21–50(100) cm long, 3–6 mm diam., (2.6)4–6(11)× as long as petiole, green, sometimes tinged red-violet, terete; spathe erect-spreading to recurled, sometimes twisted, subcoriaceous to coriaceous, green to violet-purple to maroon, lanceolate, 6.5–22(40) cm long, 1.5–4.5 cm wide, inserted at 50–70° angle on peduncle, acuminate at apex, acute at base; spadix dull salmon-pink to pale violet-purple (B & K purple 5/5), rarely greenish, sessile, slightly to moderately tapered, slightly to conspicuously curved, 10–25(47) cm long, ca. 9–10 mm diam. near base, 4–9 mm diam. midway, 2–4 mm diam. near apex, broadest at the base; flowers square to rhombic or 4-lobed, 1.6–2.5 mm long, 1.5–2.4 mm wide, the sides straight to sigmoid; 6–13 flowers visible in principal spiral, (5)8–16 in alternate spiral; tepals matte to weakly glossy, minutely papillate; lateral tepals (0.4)0.8–1.3 mm wide, the outer margins 2–4-sided, the inner margins straight to slightly rounded; pistils scarcely emergent to prominently raised, gray-green to purplish; stigma oblong-ellipsoid to slitlike, 0.3–0.6 mm long, reddish to violet-purple, darker than surrounding pistil; stamens emerging from the base of spadix, in a complete sequence, the laterals preceding the alternates by ca. 13–40 spirals, the 3rd stamen preceding the 4th by ca. 2–9 spirals; anthers yellow-red (B & K yellow-red 8/2.5), 0.4–0.6 mm long, 0.3–0.9 mm wide, inclined over the pistil; thecae broadly ovoid to ovoid-triangular, slightly or not divaricate; pollen creamy white, white when dried, the scent yeasty or like rotting fruit. *Infructescence* pendent; spathe persisting; spadix 16–28 cm long, 1.5–2.5 cm diam.; berries white to violet-red, 7–8 mm long; seeds 1–2 per fruit, oblong, 1.7–3 mm long, 1.3–2 mm wide, 0.8–1.4 mm thick, with a gelatinous appendage at both ends.

Anthurium harlingianum is endemic to the lower eastern slopes of the Colombian and Ecuadorian Andes at 440 to 1,800 m (mostly above 750 m), in areas of tropical wet, premontane wet, and wetter parts of tropical moist forest, where it is almost strictly epiphytic. It occurs in a broad arc from the Serranía de Macarena in Meta Dept. in southern Colombia, to the Province of Zamora–Chinchipe in Ecuador. Probably also belonging to the same species are several Peruvian collections from the vicinity of Tingo María in Huánuco, and one each from Junín and Pasco. However, there is room for doubt, since these areas are well out of the normal range, and no collections are known from a large intervening area.

Anthurium harlingianum is distinguished by its generally large size, hook-shaped to cucullate cataphylls, erect-spreading inflorescences, and by its leaves which usually dry dark brown.

Anthurium harlingianum is closely related to and perhaps only subspecifically distinct from *A. loretense* and *A. cataniapoense*, both of which usually occur at elevations below 300 m and occupy positions at opposite ends of the arc in the lowland Amazonian region. *Anthurium loretense* occurs at the south end of the arc in eastern Loreto Dept. in Peru, and *A. cataniapoense* occurs at the north end in the watersheds of the Río Negro and Río Orinoco in Venezuela. Both of these lowland species are distinguished from *A. harlingianum* by their pendent inflorescences and more glossy leaf blades. The blades of *A. harlingianum* are typically matte with less prominent tertiary veins than those of the other two species. Of these two species, *A. loretense* is closest to *A. harlingianum* geographically and taxonomically. It differs in having an inflorescence with both the spathe and spadix averaging about 6 cm longer than in *A. harlingianum*, and the spadix is typically more long-tapered, averaging two-thirds the length of the peduncle. In *A. harlingianum*, the inflorescence is typically erect at anthesis, but may become pendent, and the spadix is usually more stubby. It averages only about half as long as the peduncle and has a proportionally somewhat shorter spathe (ca. 3/5 as long).

All three of the above taxa share a lanceolate, usually hook-shaped cataphyll and similarly short-petiolate, coriaceous, oblanceolate leaf blades which frequently have closely set primary lateral veins at the base. In addition, all three have similarly D-shaped petiole cross sections with raised margins and an obtuse medial rib, as well as purplish violet spadices (pale purple and also ranging to other colors in the case of *A. harlingianum*).

Aside from cultivated material, the spadix of *Harling & Andersson 24496*, from Morona-Santiago, represents the lower end of spadix-length range (6.5 cm long) and is unusual in being stipitate by 5 mm. *Croat 58162*, from San Martín Dept. in Peru at 700 m, also has a stipitate spadix (6 mm in back); with its larger spadix it appears to link the last-mentioned specimen with typical material from Ecuador and with collections from further south in Peru. However, in view of its terrestrial habit on limestone rocks and leaves which dry pale green, it may represent a distinct taxon. More collections of middle-elevation *Pachyneurium* from the Department of Amazonas in Peru are needed to help solve this and similar problems in the section. Two collections from the same locality in Junín, Peru (*Killip & Smith 25528, 25604*), are unusual in being quite small for typical *A. harlingianum*, with leaf blades up to 10 cm wide, less than 50 cm long, and spadices ca. 4–7 cm long.

Anthurium harlingianum is named in honor of the Swedish botanist Gunnar Harling, who coauthored the Flora of Ecuador project with Benkt Sparre, and who has led several collecting expeditions to Ecuador.

COLOMBIA: META: Sierra de la Macarena, northern plateau, 1,000 m, *Philipson 2342* (BM, COL); Río Güejar–Río Sansa, 500–1,000 m, *Idrobo 479* (COL, US); Río Güejar–Morro Bello, El Tablazo, 500–1,200 m, *Chaparro et al. 74* (COL), *García et al. 440* (COL). PUTUMAYO: El Whiskey, S of Umbria, vic. Finca Santa Marta, *Plowman 2066* (F); Río Mocoa, 4 km E of Mocoa, 800 m, *Plowman 2027* (COL, F, GH); 700 m, 1°10′N, 76°33′W, *Croat 51762* (MO). ECUADOR: MORONA–SANTIAGO: 6 km E of Limón, rd. to La Unión, 1,300 m, *Harling & Andersson 24496* (GB); Gualaquiza, Misión Bomboiza, Misión Salesiana, 85 km NNE of Zamora, 700–800 m, 3°26′S, 78°32′W, *Sparre 19106* (S); Gualaquiza–Zamora, 5 km S of El Pangui, 800 m, 4°21′S, 78°50′W, *Croat 50816* (MO, QCA, RSA), *50817* (MO); 31 km N of Yangzatza, 1,000 m, 4°11′S, 78°49′W, *Croat 50786* (CM, MO); 20 km S of San Juan Bosco, 1,300 m, *Madison & Besse 7559* (MO, SEL). NAPO: Lago Agrio–Baeza, Río Quijos, ca. 21 km NNE of Baeza, El Chaco, 1,500 m, *Harling 3873* (S); Río Oyacachi, 23 km NNE of Baeza, N of El Chaco, 1,500–1,620 m, 0°18′S, 77°48′W, *Balslev & Madsen 10512* (AAU), *Croat 50290* (K, MO, NY, QCA, RSA, USM); 43 km E of Lago Agrio, 560 m, 0°07′N, 77°15′W, *Croat 50437* (MO); 67 km W of Lago Agrio, 760 m, *Croat 49506* (MO, QCA); 67.5 km W of Lago Agrio, 1,180 m, 0°01′N, 77°19′W, *Croat 50477* (MO, QCA); 72.5 km W of Lago Agrio, 1,166 m, *Croat 49518* (MO, NY, QCA); 74.5 km W of Lago Agrio, 1,220 m, 0°00′N, 77°20′W, *Croat 50455* (MO); Lago Agrio–Coco, 26 km N of Coco, 450 m, 0°29′S, 76°55′W, *Croat 50421* (BM, MO, US); Lago Agrio–Río San Miguel, 12.5 km N of Lago Agrio, 450 m, 0°6′N, 76°50′W, *Croat 50319* (MO, QCA); 2 km S of Río San Miguel, 21.2 km N of Lago Agrio, 470 m, 0°08′N, 76°50′W, *Croat 50350* (CM, MO, QCA, RSA), *50352* (M, MO), *50355* (AAU, CAS, CM, MO, QCA); Tena, *Asplund 10182* (S); Tena–Puyo, 1.7 km S of Río Napo, 440 m, 1°04′S, 77°47′W, *Croat 58899* (MO); Tena–Puyo, 5.5 km S of bridge over Río Napo, 510 m, 1°05′S, 77°47′W, *Croat 58922* (MO, QCA, UC); Tena–Puyo, 58–61.5 km N of Puyo, 500–600 m, *Croat 49629* (MO, QCA), *49663* (MO); Río Aguarico, road to Cepe Ferry Crossing, E of Lago Agrio, 450 m, 0°2′N, 76°50′W, *Croat 50429* (MO); Río Tena, 2 km W of Muyuna, 5.7 km W of Tena, 500 m, 0°01′S, 77°51′W, *Croat 58854* (CM, MO, QCZ); Cantón Archidona, Challuayacu, Carretera Hollin–Loreto, Km 25–31, 1,230 m, 0°43′S, 77°40′W, *Hurtado 1161* (MO); Carretera Hollin–Loreto–Coca, between Río Pucuno and Río Guamani, 0°46′S, 77°26′W, 1,100–1,200 m, *Céron 2901* (MO, QCNE); Cantón Loreto, Huaticocha, Carretera Hollin–Loreto, 575 m, *Hurtado et al. 1380* (MO); Reserva Biologica Jatún Sacha, Río Napo, 8 km E of Misahuallí, 1°4′S, 77°36′W, 450 m, *Cerón 1227* (MO, QCNE), *Palacios 2465* (MO). PASTAZA: Mera, 1,160 m, *Harling 3689, 3815* (S); Río Pastaza, Mera, *Lugo 1116* (GB); Mera–Baños, 1 km E of Topo, 1,300 m, 1°27'S, 78°10'W, *Palacios et al. 190* (MO, NY, QAME, QCNE); 3 km from turnoff from Puyo-Mera road, Tarabita, 1,000 m, *Croat 49688* (MO, QCA); Puyo-Baños, 5.7 km W of Shell, 1,070 m, 1°26'S, 78°09'W, *Croat 59076* (CM, MO, QCA); Puyo-Baños, 0.6 km E of Río Negro, 2 km W of El Topo, 1,160 m, 1°24'S, 78°12'W, *Croat 59110* (F, MO, QCA); Puyo-Macas, 19 km S of Puyo, 1,200 m, 1°37'S, 77°53'W, *Croat 50558* (MO, QCA), *50565* (MO, QCA), *50574* (CM, MO, QCA), *50576* (MO); Puyo-Macas, 33 km S of Puyo, 16 km S of Escuela Fiscal Cotopaxi, 900 m, 1°38'S, 77°52'W, *Croat 58967* (MO, QCA); 3.8 km from Puyo-Macas road, road to Canelos, 850 m, 1°37'S, 77°51'W, *Croat 58984* (MO, QCA). ZAMORA-CHINCHIPE: 2 km N of Zamora, 930 m, *Madison 2460* (SEL); carretera de PETRO-CANADA under construction, via Auca, 115 km S of Coca, S of Río Tiguino, 320 km, 1°15'S, 76°55'W, *Zak & Rubio 4318A* (MO); Loja-Zamora, 15 km above Zamora, 1,800 m, *Madison 2503* (SEL). PERU: HUÁNUCO: Tingo María Region, Prov. Huánuco, Huánuco-Pucallpa, Tingo María, Naranjillo, 600-700 m, *Ferreyra 2210* (USM, NY); Prov. Leoncio Prado, Río Huállaga, 650-800 m, *Croat 57955* (F, MO, RSA, USM), *Gentry et al. 15925* (MO), *15970* (F, MO), *Plowman & Ramírez 7568* (F, MO, US), *Solomon 3387* (MO); 25 km N of Tingo María, 1,000 m, *Winter s.n.* (*USDA PI#390586*), cult. at Univ. of Hawaii (*Kamemoto* 398) (MO); Prov. Leoncio Prado, Dtto. Rupa Rupa, Cerro Quemado, E of Tingo María, 800-850 m, *Schunke 10498* (MO); Tingo María-Pucalpa, La Divisora, 1,650 m, 9°07'S, 75°48'W, *Plowman s.n.* (Selby Garden 78-1918) (MO). JUNÍN: Pichis trail, Yapas, 1,350-1,600 m, *Killip & Smith 25528*, *25601* (NY, US), *25604* (US). PASCO: Prov. Oxapampa, 20 km from Pte. Paucartambo, rd. to Oxapampa, 1,100 m, 10°41'S, 75°24'W, *Smith 7570* (MO). SAN MARTÍN: Moyobamba-Chachapoyas, 13.5 km W of Naranjos, km marker 415, 700 m, 5°38'S, 77°25'W, *Croat 58162* (MO, USM).

Anthurium holmnielsenii Croat, sp. nov. TYPE: Ecuador. Pichincha: between Pacto and Nuevo Azuay, 15.3 km N of Pacto, 1,320 m, 0°11'N, 78°04'W, *Croat 61640* (holotype, MO 3422019; isotypes, B, K). Figures 156, 157, 159-161.

Planta epiphytica vel terrestris; internodia brevia, 1.5-3.5 cm diam.; cataphyllum lanceolatum, persistens fibris linearis; petiolus (18)24-47 cm longus, 7-12 mm diam., acute D-formatus; lamina coriacea, oblongo-oblanceolata aut oblanceolata-elliptica, apice longo-acuto, basi anguste acute, (50)76-98.5 cm longa, (11)13-27 cm lata; nervo collectivo e basi. Pedunculus 24-64 cm longus, 3-6 mm diam., 1.4-2-plo longiorus quam petiolo; spatha 6-17.5 cm longa, 1.5-2.7 cm lata; spadix 9-20.5 cm longus, viridis, longe contractus; baccae aurantiacae, 3.5-4.7 mm longae, 2.3-2.7 mm latae.

Epiphytic, occasionally terrestrial; stem 1.5-3.5 cm diam.; leaf scars 1.5-1.7 cm high, 2.2-2.5 cm wide; roots dense, descending, pale, moderately elongate; cataphylls coriaceous, lanceolate, 17-25 cm long, narrowly acute at apex, drying light brown to tan, persisting as linear fibers at the apex of the stem. *Leaves* spreading; petioles (18)24-47 cm long, 7-12 mm diam., sharply D-shaped and slightly thicker than broad, broadly convex to weakly ribbed medially adaxially, the margins sharply raised to winged, rounded abaxially; geniculum thicker and paler than petiole, becoming fissured transversely with age, 1-3 cm long; blades coriaceous, oblong-oblanceolate to oblanceolate-elliptic, long-acuminate at apex, narrowly acute at base, (50)76-98.5 cm long, (11)13-27 cm wide, the margins broadly undulate; upper surface matte to semiglossy, dark green, lower surface semiglossy to glossy, slightly paler; both surfaces drying concolorous, green to yellowish; midrib above prominently convex and paler than surface, below thicker than broad at base of the blade, becoming prominently convex toward the apex and paler than surface; primary lateral veins numerous, to more than 20 per side, departing midrib at 45-60° angle, ± straight to the collective vein, moderately obscure, weakly sunken to raised above, darker than surface and weakly raised below; interprimary veins almost as conspicuous as primary lateral veins, numerous; tertiary veins obscure, raised on drying; collective vein arising from near the base, weakly sunken above, equally as prominent as primary lateral veins on drying and when fresh, 5-25 mm from margin. *Inflorescences* spreading; 24-64 cm long, 3-6 mm diam., 1.4-2(3.4)× as long as petiole, green tinged with purple, terete; spathe erect to spreading, subcoriaceous, green, sometimes heavily tinged purplish or red, broadly lanceolate to oblong-lanceolate, 6-17.5 cm long, 1.5-2.7 cm wide, broadest near the base, acuminate at apex (the acumen inrolled), acute to obtuse at base; stipe 1-2.2 cm long in front, 1-2 mm long in back; spadix green (B & K yellow-green 5/5), also reported as brownish, long-tapered, subsessile, straight to prominently curved, 9-20.5 cm long, 6-9 mm diam. near base, 3-4 mm diam. near apex; flowers square, 2.3-2.7 mm in both directions, the sides smoothly to jaggedly sigmoid; 7-8 flowers visible in principal spiral, 4-5 in alternate spiral; tepals matte, densely and minutely papillate; lateral tepals 1.2-1.4 mm wide, the inner margins straight, the outer margins 2-4-sided; pistils slightly raised, minutely papillate, green; stigma linear, 0.4-0.5 mm long, the laterals preceding the alternates by 8-9 spirals, the 3rd stamen preceding the 4th by 1-3 spirals; filaments fleshy, translucent, somewhat flattened, 0.7-0.8 mm wide; anthers dark yellow, 0.6-0.8 mm long, 0.6-0.9 mm wide; thecae oblong-ovoid, not divaricate; pollen orange. *Infructescence* with the spathe persisting; spadix 16.8-31 cm long, 1.4–2.3 cm diam.; berries orange, oblong-ovoid, slightly beaked, 6.5–7.4 mm long, 4–4.5 mm diam.; pericarp somewhat thickened, with linear raphide cells; mesocarp transparent, gelatinous; seeds 1–2 per berry, yellowish brown when dried, oblong, sometimes ovoid, 3.5–4.7 mm long, 2.3–2.7 mm diam., 1.6–2 mm thick, with a gelatinous, sticky appendage at both ends.

A member of series *Multinervia*, *Anthurium holmnielsenii* is known only from Ecuador in the provinces of Los Ríos, Imbabura, Pichincha, and Cotopaxi at 250 to 1,500 m in tropical moist and premontane wet forest, where it grows either terrestrially or as an epiphyte.

This species is distinguished by its concolorous, green-drying leaf blades with numerous primary lateral veins and a collective vein arising from near the base, sharply D-shaped petioles, long-tapered, green spadix, and orange berries.

Anthurium holmnielsenii is closely allied to *A. acutissimum*, and differs in having petioles with sharply raised margins and spreading-pendent to more or less erect leaves with broader blades (3.3–6.5(7) vs. (6.7)7.5–10(11) times longer than broad).

This species is named in honor of Lauritz B. Holm-Nielsen, who has coordinated much of the botanical activity in Ecuador by the University of Aarhus, Denmark.

ECUADOR. COTOPAXI: Río Guapara, 20 km NW of El Corazón, 250 m, *Sparre 17113 bis* (S). IMBABURA: Colloapi, 840 m, *Solís 12889* (F). LOS RÍOS: Río Blanco, Santo Domingo–Esmeraldas, 3 km S of Km 24, 250 m, 0°5′S, 79°15′W, *Croat 50689* (K, MO, QCA). PICHINCHA: El Paraiso–Saguangual, 3 km from El Paraiso, 1,500 m, 0°10′N, 78°46′W, *Oellgaard et al. 37773* (AAU); Pacto–Nuevo Azuay, 5 km N of La Esperanza, 1,300 m, *Holm-Nielsen et al. 24542* (AAU, MO); 15.3 km N of Pacto, road, 2.3 km N of Paraiso, 1,320 m, 0°11′N, 78°04′W, *Croat 61640* (B, K, MO).

Anthurium iramirezae Bunting, Ann. Missouri Bot. Gard. 76: 917–918, 1989. TYPE: Venezuela. Amazonas: Dpt. Río Negro, Serranía de Tapirapeco, outcrop of granitic rocks, 1,350 m, 1°20′N, 64°55′W, *I. Ramirez & Laskowsky 310* (holotype, VEN). Figure 353.

Epilithic; stem thick, reclining horizontally; internodes short; cataphylls persisting. *Leaves* few; petioles 19–40 cm long, subterete, sulcate adaxially, the margins rounded; geniculum 1.7–2.3 cm long, 1–1.2 cm thick; blades held erect on petioles, ovate, obtuse to short-acuminate at apex (the acumen with a cusp to 1.3 cm long), cordate at base, 30–37 cm long (equaling or twice as long as petioles), 19–24 cm wide (1.5–1.7× longer than wide); sinus arcuate; upper surface glossy, lower surface slightly paler and brown glandular-punctate; major veins prominently raised on upper surface; basal veins 2 pairs, free to base (not naked at the sinus); primary lateral veins 7(8) per side, departing midrib at 45–55° angle, almost straight or weakly arcuate-ascending to the margin; tertiary veins prominent on both surfaces. *Inflorescences* longer than leaves; peduncle 45–71 cm long; spathe recurved or reflexed, persistent, green, narrowly oblong-ovate, 11 cm long, 0.8 cm wide, decurrent at base for 8 mm; spadix dark purple, becoming green with age, slightly tapered, sessile, 13.3–15.3 cm long, 7.5 mm diam.; 6–8 flowers visible in principal spiral. *Infructescence* to 1.5 cm diam.; berries unknown.

Anthurium iramirezae is endemic to Venezuela, known only from the type locality in an area of premontane rainforest, at 1,250 m.

The description given here is based only on the original type description and the species is therefore imperfectly known.

This species is distinguished by its broadly ovate, subcordate, glandular-punctate blades and narrowly oblong-ovate spathe.

It is most closely related to *A. guanchezii*, but that species differs in having the geniculum remote from the base of the leafy portion of the blade, as well as by having naked basal veins and a narrowly ovate spathe which is 3.6× longer than broad.

Anthurium iramirezae is perhaps most easily confused with *A. wurdackii*, but that species has proportionally narrower (about 1.9× longer than broad) blades with angular rather than acute sinus and epunctate lower surface, and its spathe decurrent for 3.5 to 7.5 cm.

VENEZUELA. AMAZONAS: Río Negro, Serranía de Tapirapeco, outcrops of granitic rocks, 1,350 m, 1°20′N, 64°55′W, *Ramirez & Laskowsky 310, 318* (VEN).

Anthurium jenmanii Engl., Pflanzenr. IV. 23B(Heft 21): 72. 1905. TYPE: Guyana. Essequibo, *Jenman 5760* (lectotype, K; isolectotypes, BRG, NY).

Anthurium englerianum Bunting, Acta Bot. Venez. 10: 270. 1975. TYPE: Venezuela. Monagas: between Guáchardo & Cueva del Guácharo, 1 km above El Guácharo, *Bunting 2653* (holotype, MY).

Anthurium trinitatis Engl., Pflanzenr. IV. 23B(Heft 21): 73. 1905. TYPE: Trinidad, *Fendler 741* (holotype, K; isotype, NY).

Epiphytic, epilithic or terrestrial; stem short, (1)1.5–3 cm diam.; roots dense, spreading to ascending, pale green to brownish, thick and blunt, ca. 5–10 cm long, 3–6 mm diam.; cataphylls broadly lanceolate, subcoriaceous to coriaceous, (3)5–7 cm long, acute at apex, drying dark brown, persisting semi-intact or as a reticulum of fibers. *Leaves* erect to erect-spreading; petioles (3)7–20(38) cm long, 6–15 mm diam., bluntly to sharply D-shaped, flattened to weakly convex adaxially, rounded abaxially, the surface pale-speckled; geniculum slightly paler and moderately thicker than petiole, 0.5–2.5 cm long; sheath 1–6 cm long; blades coriaceous, broadly oblanceolate to elliptic (rarely ovate-elliptic), shortly and abruptly acute (rarely long-acuminate or obtuse-rounded) at apex, narrowly acute to obtuse to broadly truncate to sometimes weakly subcordate at base, (22)40–103 cm long, (8)11–52 cm wide, broadest near the middle or in the upper fourth, the margins moderately and broadly undulate; upper surface semiglossy to glossy, yellowish green, lower surface matte to weakly glossy, moderately paler, drying yellow-green, matte; midrib flat at base, soon becoming bluntly acute above and conspicuously paler than surface, prominently convex to higher than broad at base, becoming obtuse-rounded toward the apex below, slightly paler than surface; primary lateral veins 5–13 per side, departing midrib at 30–60° angle, broadly arcuate-ascending to the margin, the uppermost merging into a collective vein, raised near midrib, sunken at margin, moderately paler than surface above and below; interprimary veins absent except near the base, less conspicuous than primary lateral veins; tertiary veins sunken above, raised below, raised when dried; reticulate veins prominulous above and below when dried; collective vein arising in the upper third of blade or absent, equally as prominent as primary lateral veins, 6–15 mm from margin. *Inflorescences* spreading-erect to spreading-pendent, equaling or longer than leaves; peduncle 26–86 cm long, 5–9(15) mm diam., 3.4–6× as long as petiole, pale-speckled, colored like petiole, sometimes ringed with purple, terete to elliptic; spathe reflexed, usually soon withering and becoming twisted, subcoriaceous, pale green tinged with purple, becoming purple at anthesis, oblong to lanceolate, 11–50 cm long, 1.5–4.5 cm wide, broadest near the base, inserted at 30–60° angle on peduncle, acuminate at apex (the acumen 8 mm long), narrowly acute to obtuse, sometimes decurrent for 3–4 cm at base; stipe absent or to 4–5 cm long in front, to 1 cm long in back; spadix dark maroon to dark purple, sometimes bluish pre-anthesis, tapered to cylindroid, usually sessile to weakly stipitate, nearly straight to slightly curved, 10.4–47 cm long, 6–9(12) mm diam. near base, ca. 4 mm diam. near apex, broadest at the base; flowers rhombic, 1.8–2.7 mm long, (1.3)1.7–2.2 mm wide, the sides straight to slightly sigmoid; 6–14 flowers visible in principal spiral, 6–10 in alternate spiral; tepals matte to semiglossy, minutely papillate; lateral tepals 1–1.2 mm wide, slightly convex, erose, the outer margins 2-sided; pistils not emergent, whitish; stigma slitlike, colored like tepals, 0.5 mm long; stamens emerging in a slow, regular sequence from the base, the laterals preceding the alternates by 7–12 spirals, the 3rd stamen preceding the 4th by 1–8 spirals, held against the pistil and obscuring it; anthers pale yellow to orange, 0.4–0.5 mm long, 0.5–0.7 mm wide; thecae ovoid, divaricate; pollen yellow, fading to whitish, moderately sweet-scented. *Infructescence* pendent; berries pale reddish purple to purple or white tinged with violet apically, obovoid, rounded at apex, to 10 mm long, 7 mm diam.; seeds 2 per berry, oblong to obovoid, 8 mm long, 3 mm diam.

Anthurium jenmanii ranges from Trinidad and Tobago and Venezuela (Sucre and Monagas; one collection from northeastern Bolívar) to Guyana, Surinam, French Guiana, and Amapá in Brazil. It is the only species, besides *A. fendleri,* which is extra-Amazonian in northern South America and which also occurs in lowland Amazonia. Instead of achieving this via the Guianas, *A. fendleri* ranges south to the departments of southern Colombia. *Anthurium jenmanii* occurs mostly below 500 m in moist forest as well as in dry open woodlands and granite outcrops, where it may be terrestrial, epiphytic, or epilithic.

This species is recognized by its large, coriaceous blades with impressed tertiary veins on the upper surface (when fresh), which usually dry yellow-green. Also characteristic are its purple spadix and spathe, the latter usually withering early, and by its reddish purple berries. The leaf bases are highly variable, ranging from acute to somewhat subcordate (see below). Staminal progression is markedly slow, the spadix requiring over one month under office conditions (room temperature) to complete anthesis throughout its length of 14 cm.

Specimens from throughout the range of *A. jenmanii* may have basally obtuse-rounded or even subcordate leaf blades; *Sheffer 265,* originally collected in Trinidad and cultivated at the University of Hawaii, and *Sastre 1665,* from the Tumuc-Humac Mountains in Brazil, are examples of the latter end of the spectrum. One collection, *Geyskes 16,* from the Tumuc-Humac Mountains along the Brazilian border in Surinam, is noteworthy in having leaf blades conspicuously pustular on the lower surface. This character is typical for *Anthurium* *bonplandii* subsp. *guayanum*, but that subspecies typically has often dark, plate-shaped glands in addition and occurs at higher elevations; no collections of the latter are known from the Tumuc-Humac Mountains. *Sastre 1665* and *Granville 1179*, also from these mountains, are more typical of *A. jenmanii* and have no pustules on the leaf blades. This region is in general poorly known, and further collections would greatly help to understand the geographical distribution and variation of *A. bonplandii* and *A. jenmanii*, and also *A. cataniapoense*. Another noteworthy collection is *Cremers 7405*, from north-central French Guiana, which is aberrant in having a leaf blade so attenuate at the base that the geniculum appears remote from the blade by up to 4.5 cm.

In 1975, Bunting described *A. englerianum*, based on material collected in Sucre in the Coastal Cordillera of Venezuela, 1 km above Guácharo. Examination of the type and material collected at the same site (*Croat 54389*) revealed no characters that can be used to separate *A. englerianum* from *A. jenmanii*, despite the fact that the type locality of *A. englerianum* is at 970 m elevation. It is here synonymized for the first time.

WITHOUT LOCALITY. *Potter 5299* (NY); cultivated, *Croat 45053* (MO). BAHAMAS. Cultivated, Nassau, New Providencia, *Moore 7023* (BH). BRAZIL: Serra Tumucumaque, Massif du Mitaraka, 500 m, *Sastre 1665* (CAY, US). AMAPÁ: Roche, Cachoeira Grande, *Irwin et al. 47417* (IAN, NY); Cachoeira Utussansain, island in Cachoeira, *Irwin et al. 48000* (NY, US); Rio Araguari, downriver from Pôrto Platon, *Pires et al. 51152* (NY); Rio Jari, Cochoeiras das Aurucuopatari, 120 m, 0°28′N, 53°7′W, *Egler & Irwin 46468* (NY, US, MG); Rio Maraca, Mazagão, *Rabelo et al. 2200, 2210* (NY); Rio Oipoque, near Mt. Carupina, 10–80 m, 3°33′N, 51°37′W, *Pires & Westra 48823* (US); Cachoeira Grande Roche, *Froes 26695* (IAN, RB), *Luetzelburg 20265* (M); AMAPÁ–PARÁ: Serra Tumucumaque, via Rio Cumina, *Sampaio 5267, 5424* (RB). FRENCH GUIANA. WITHOUT LOCALITY: *Hay 2827*: cultivated at M (*#84/3632*) (MO); W Bas Oyapock, Haut de la Cirque Armontabo, *Cremers 7047* (CAY, K); Bassin du Ha, Akouba Booka goo Soula, 160 m, *Granville et al. 9779* (CAY, P, US); Bassin du Haut–Marouini, 230 m, *Granville et al. 9908* (CAY), 200 m, *9291* (CAY); Bassin de l'Oyapock, 10 m, *Cremers 9936* (CAY); Camopi River above its mouth at Tamouri River, *Granville 2097* (CAY, US); Grand Canori, *Oldeman 1979* (CAY); Montagne Maripa, *Granville 2870* (CAY, P); Pedra Alice, *Irwin et al. 47566* (NY); opposite Pedra Alice, *Irwin et al. 47604* (NY); Savanes–Roches, Fleuve Oyapock, *Oldeman 2575* (MO); St. Elie, *Prevost 740* (CAY); NW of Sinnamary, W of Orstom "Ecrex" Project, St. Elie Track, 250 m, *Croat 53848* (MO); Brazilian border, Trois Sauts, 300–350 m, *Grenand 1091* (CAY, P); Massif des Emerillons, 450 m, *Cremers 6594* (CAY, K); 300–350 m, *Cremers 6639* (CAY); Montagne des Trois Pitons, second peak, *Oldeman 2609* (CAY, US); Monts de la Trinite, Inselberg NW of Monts de la Trinité, *Cremers 7405* (K); Mt. St. Marcel, Haut Oyapock, 300–450 m, *Sastre 4412* (P); Haut Tampoc, S of Pier Kourou, *Cremers 4517* (CAY); Tumuc-Humuc, *Granville 1179* (CAY, P); Brazil and Surinam border, summit of Palouloulmeenpeu, 707 m, *Granville 1103* (CAY, K, MO). GUYANA: Cayenne, *Fevillet 1126* (U); Tumatumari, *Gleason 172* (NY); Rockstone, *Gleason 617* (GH, NY); Mazaruni station, *Forestry Dept. 2939* (K); Quebrada Camonnie, *Jenman 2026* (K); Demerara River, Christianburg, *Bartlett s.n.* (BRG); Río Essequibo, Morabilli Creek, near Bartica, 0 m, *Sandwith 427* (K); Mazaruni River, upper part, *Leng 355* (NY); Potaro–Siparumi Region. Chenapou, Amerindian village (Patumona), 50 km upstream from Kaieteur Falls, 450 m, 5°00′N, 59°34′W, *Kvist et al. 302* (US). ESSEQUIBO: *Jenman 5760* (BRG, K, NY); Bo River, Kurihi Falls, *Forestry Dept. 7060* (K, NY). HAWAII. Cultivated at Pacific Tropical Bot. Gard. *Croat 44872* (MO, SEL). SURINAM: Cultivated, originally collected by Dodson, Paramaribo, *Madison 1927* (SEL); Nassau Mts., Marowijne River, 550 m, *Cowan & Lindeman 39100* (F, NY, US, U); Paloemeu River, Palaimee Savannah, *Geyskes s.n.* (U); Tumuc–Humac Mts., Temomairem, 200 m, 3°00′N, 55°23′W, *Geyskes 16* (U, NY); Wosuna Falls, 300 m, *Daniels & Jonker 833* (NY, U). SARAMACCA: Wilhelmina Gebergte, WSW of Juli Anatrop, *Werkhoven 16712* (BBS, SEL). TOBAGO. Great Dog River, *Eggers 5802* (US); Little Tobago, *Broadway 4909* (US), *Dinsmoore 38* (WIS), *Purseglove 6325* (K, US); Mason Hall, *Broadway 4832* (US). TRINIDAD: *Broadway 4106* (BM), *Fendler s.n.* (BM), *Fendler 741* (BM), *Hart s.n.* (TRIN); Cultivated, *Bailey & Bailey s.n.* (BH); Tabaquite, Monserrat Hills, *Jermy 2543* (cult. at Kew) (K); Arima–Blanchisseuse, milepost 18.75, 30–60 m, *Simmonds 126* (K); Caspar Grande, Pt. Baleine, 30 m, *Simmonds 82, 116* (K, TRIN); Cumaca road, turnoff 2 mi. E of Valencia, 200 m, *Croat 53918* (MO); Hart's Cut to Belle View, *Britton & Bailey 2236* (K, NY); Matura–Valencia, Mi. 8, E of Valencia, less than 150 m, *Croat 53915* (MO); Moruga, *Broadway 7621* (TRIN); Pointe Gourde, overlooking Telephone Bay, *Philcox 8084* (K, NY); Port of Spain, *Broadway 4176* (K), *Elmore R9* (LAM); Rapsey, *Sheffer 265* (MO); Teteron Bay, *Broadway 6886* (BM, MO); Valencia, *Britton & Britton 2101* (K, NY); Gasparee Island, *Britton & Coker 554* (NY, US); Guaico–Manzanilla Reserve 30–60 m, *Philcox et al. 8034* (K); Matura Forest Reserve, Toco Road, 50 m, *Philcox et al. 8075* (K); Monos Island, *Williams s.n.* (TRIN); en route to Huevos Island, Gulf of Paria, *Ewan 17050* (BM, GH). VENEZUELA. BOLÍVAR: Altiplanicie de Nuria, E of Miamo, 500–600 m, *Steyermark 88526* (NY, US); Río Toro (Río Grande) Río La Reforma–Puerto Rico, N of El Palmar, 200–250 m, *Steyermark 88110* (F, NY, US, VEN). MONAGAS: El Guácharo–La Cueva del Guácharo, *Bunting 2653* (MY, NY), *4351* (NY); 1.5 km above Guácharo, 1.5 km below Cuevas del Guácharo, 970 m, 10°10′N, 63°31′W, *Croat 54389* (B, MO, VEN). SUCRE: El Pilar–Guariguen, 4–10 km S of El Pilar, 10°31′N, 63°06′W, *Croat 54382* (F, IBE, K, M, MO, SEL, US); Quebrada del Purgatorio, E of Grapa, *Lasser & Vareschi 3851* (VEN); Península de Paria, Cerro Patao, 300 m, 10°41′N, 62°3′W, *Milliken et al. 38* (MO); Cristóbal Colón, *Broadway 170* (GH, NY, US); Cumanacoa–Caripe, La Cuestra, 6 km NW of Las Piedras, 760 m, *Bunting 2697, 2697S* (NY); Lago de Guanoco, *Lasser & Vareschi 3906* (VEN); Dtto. Cajigal, Santa Isabel, *Fernandez 3349* (MY).

Anthurium johnsoniae Croat, sp. nov. TYPE: Originally collected in Colombia. Magdalena: between Santa María and El Campano, vic. of Minca, road above Santa María via Bonda, cultivated by Marilyn and Al Johnson, *Croat 62835* (holotype, MO 3656446).

Planta terrestris; internodiis brevibus, caule 1–3 cm diam.; cataphyllum persistens intactum mox deciduum; petiolus D-formatus vel quadrangularis, complanatus adaxialiter, 2–3 costatus abaxialiter; lamina late oblanceolata, (24)50–70 cm longa, (11)17–30 cm lata; nervis primariis lateralibus 6–16 utroque, sub angulo circa 50°–90°; pedunculus 24 cm longus; spatha lanceolata, viridis, 9.8 cm longa, 1.4 cm lata; spadix longe protractus, purpureus in apice, ochraceus ad basim. Baccae ignotae.

Stem short, ± slender, 15–50 cm long, 1–3 cm diam.; roots moderately numerous, spreading to descending, grayish white to whitish green, glabrous, minutely but conspicuously warty, elongate, weakly tapered, 3–5 mm diam.; cataphylls thinly subcoriaceous, narrowly straight-lanceolate, prominently 1-ribbed throughout, 7–18 cm long, acute to obtuse and with subapical apiculum, pale green (B & K yellow-green 6/5), drying reddish brown (B & K yellow-red 4/7.5), persisting intact, eventually deciduous. *Leaves* erect to spreading; petioles 12–29 cm long, 4–10 mm diam.; D-shaped to quadrangular, flattened to shallowly sulcate adaxially, sometimes with the margins weakly raised, prominently 2–3-ribed abaxially; geniculum thicker than petiole, becoming fissured transversely with age, 1.3–2 cm long; blades subcoriaceous, broadly oblanceolate, abruptly and shortly acuminate at apex (the acumen apiculate), obtuse to acute to narrowly acute at base, (24)50–70 cm long, (11)17–30 cm wide, broadest above middle, the margins broadly undulate; upper surface weakly glossy, dark to medium green (B & K yellow-green 3/10), lower surface semiglossy to weakly glossy, moderately paler; midrib flat at base, becoming obtusely and narrowly angular toward the apex above, paler than surface, prominently higher than broad with sharp ridge at base, becoming convexly raised and flat toward the apex below; primary lateral veins 6–16 per side, departing midrib at 50–90° angle, straight to weakly arcuate, convexly raised, much paler than surface above, slightly raised below; tertiary veins obscure above and darker than surface below; collective vein arising from below the middle, weakly sunken above, slightly darker than surface below, 3–7 mm from margin. *Infloresences* with peduncle 24 cm long, 3–5 mm diam., 0.9× as long as petioles, green subterete; spathe reflexed, subcoriaceous, green, lanceolate, 9.8 cm long, 1.4 cm wide, broadest near the base, acute at apex (the acumen inrolled, 3 mm long), acute and somewhat decurrent at base; spadix maroon in the upper ⅓, brownish yellow-ochre at base (B & K yellow 5/5), long-tapered, sessile to subsessile (stipe to 2 mm long), slightly curved, held at 160° angle from peduncle, (7)16–22 cm long, 5–8 mm diam. near base, 2–3 mm diam. near apex, broadest at the base; flowers rhombic to square, 1.5–2 mm long, 1.2–1.5 mm wide, the sides straight, becoming smoothly sigmoid; 7–8 flowers visible in principal spiral, 10–12 in alternate spiral; tepals densely and minutely papillate; lateral tepals 0.8–1 mm wide, the inner margins broadly rounded, the outer margins 2–3-sided; pistils not seen; stamens barely emerging above level of tepals and persisting, the laterals preceding the alternates by 12–14 spirals, the 3rd stamen preceding the 4th by 7–8 spirals, held in a tight cluster above the pistil; anthers yellow, 0.4–0.5 mm long, 0.5 mm wide, obscuring pistil; thecae oblong-ovoid, slightly divaricate; pollen bright yellow. *Infructescence* with the spathe persisting; spadix 23 cm long, 2.8 cm diam., bearing berries in the basal portion only; berries orange, broadly ellipsoid, apparently truncate and with radial ridges at apex, 10–12 mm long, 4.8–5 mm diam.; seeds 2 per berry, dark yellowish with numerous pale raphides on the surface, oblong, flattened, 4.7–6 mm long, 2–2.5 mm diam., 1.2–1.7 mm thick.

Anthurium johnsoniae is known only from a live collection made by Marilyn and Al Johnson near Minca in Magdalena Province in Colombia, apparently in a premontane wet forest life zone.

This species is distinguished by its glabrous, minutely warty roots, leaf blades with primary lateral veins spreading at a broad angle and with a collective vein mostly arising from near the base, and by its ellipsoid, orange berries.

Because of the broadly spreading primary lateral veins and basal collective vein origin, *A. johnsoniae* resembles most closely *A. caucavallense*, also from Colombia, which has smooth roots and purple berries.

The species is named in honor of one of the collectors, Marilyn Johnson, of Miami, Florida.

COLOMBIA. MAGDALENA: between Santa Marta and El Campano, vic. of Minca, road above Santa María, via Bonda, originally collected by Marilyn & Al Johnson, *Croat 62835* (B, COL, K, MO, NY, US).

Anthurium knappiae Croat, sp. nov. TYPE: Peru. San Martín: Lumas, on old trail from Yumbatos to San Antonio de Cumbasa, S of Shapajilla, lower slopes of Cerro Isco, 400–500 m, *Knapp et al. 8544* (holotype, MO 3483655; isotypes, B, US, USM).

Planta epiphytica; caulis ignotis; cataphyllum persistens in fibris pallidus; petiolus 34.5–42 cm longus, 6–7 mm diam., sulcatus; lamina late elliptica, 57–61 cm longa, 18–19.5 cm lata, basi attenuata; pedunculus 74–93 cm longus, 4–5 mm diam.; spatha lanceolata, viridis, 10–12 cm longa, 1–1.3 cm lata; spadix cremeus vel viridis, cylindroidius, 6–11 cm longus, ca. 4 mm diam.

Description based on dried material only. Epiphytic on rotten logs; stem unknown; cataphylls ca. 7 cm long, apparently persisting as weathered pale fibers. *Leaves* erect-spreading; petioles 34.5–42 cm long, 6–7 mm diam., sulcate with the margins apparently acute, apparently acutely 1-ribbed abaxially; geniculum ca. 1 cm long; sheath 4.5 cm long; blades subcoriaceous, broadly elliptic, acuminate at apex, long-attenuate at base, 57–61 cm long, 18–19.5 cm wide, broadest at or near the middle, the margins flat, both surfaces yellow to olive-green; midrib convexly raised above, prominently raised and apparently acutely angled toward the base below; primary lateral veins 12–16 per side, departing midrib at 50–80° angle, slightly arcuate to the collective vein, weakly raised above and below; interprimary veins much less to almost as conspicuous as primary lateral veins; reticulate veins weakly raised; collective vein arising from the base, equally as prominent as primary lateral veins, 10–16 mm from margin. *Inflorescences* erect; peduncle 74–93 cm long, 4–5 mm diam., 1.8–2.4× as long as petiole, green, terete; spathe spreading to reflexed, subcoriaceous, green, lanceolate, 10–12 cm long, 1–1.3 cm wide, broadest near the base, inserted at ca. 20° angle on peduncle, acuminate at apex (the acumen with apiculum 4 mm long, inrolled and recurled), prominently decurrent for 2–3 cm at base; spadix "creamy," probably somewhat greenish (post anthesis), cylindroid, sessile, 6–11 cm long, 4 mm diam.; flowers square, ca. 4 mm in both directions; 5–6 flowers visible in principal spiral, 4–5 in alternate spiral; tepals with conspicuous pale raphide cells; lateral tepals 1–2 mm wide, the inner margins broadly rounded, the outer margins 2-sided; anthers 0.8–1 mm long, 1.4–1.8 mm wide, inclined over the pistil; thecae ovoid, slightly divaricate. *Infructescence* (immature) erect-sreading; spathe persisting, green; spadix 8 cm long, 1 cm diam.; berries green, ellipsoid.

Anthurium knappiae is endemic to Peru, known only from the type locality, at 400 to 500 m, probably in an area of premontane wet forest. The type specimen was collected in the Tarapoto region, about 20 km north of Tarapoto. It is one of six or more *Pachyneurium* species from this region.

This species is distinguished by its broadly elliptic, long-petiolate leaves which dry green and have the collective vein arising from near the base, and by its long-pedunculate inflorescence with a greenish spadix.

This species is most closely related to *A. oxycarpum*, differing in its petiole being 2–3× longer, its attenuate leaf base (only rarely attenuate for *A. oxycarpum*), its much longer peduncle (74–93 cm long vs. 18–55 cm long for *A. oxycarpum*), and its pale, raphide-cell-covered, nonglaucous tepals (vs. conspicuously glaucous and apparently free of raphide cells in *A. oxycarpum*).

The new species is named in honor of Sandra Knapp, who made the type collection.

PERU. SAN MARTÍN: Cerro Isco, lower slopes, old trail from Yumbatos to San Antonio de Cumbasa, Lumas, S of Shapajilla, 400–500 m, 6°20'S, 76°24'W, *Knapp et al. 8544* (B, MO, US, USM).

Anthurium krukovii Croat, sp. nov. TYPE: Brazil. Amazonas: Maraa, Rio Japurá, Lago Maraa, vic. of Maraa, 1°51'S, 65°36'W, *Plowman et al. 12211* (holotype, INPA; isotype, MO 3117449).

Planta terrestris aut epiphytica; internodia brevis, 5–10 mm diam.; cataphyllum lanceolatum, persistens intactum; petiolus 19.5–38 cm longus, 3–7 mm diam., subteres, anguste sulcatus; lamina ovato-elliptica, 26–40 cm longa, 11–18 cm lata; geniculum remotus 4–11 cm; pedunculus 31–57.5 cm longus, 3–4 mm diam.; spatha oblongo-lanceolata, 8 cm longa, 7 mm lata; stipes 1.5–3.5 cm longus; spadix atrorubens ad brunneus, 12–15 cm longus, 4–5 mm diam.; baccae violaceae.

Description based on dried material only. Terrestrial or epiphytic; stem 5–10 mm diam.; roots dense, numerous, spreading, pubescent, relatively short, bluntly pointed, 1–5 mm diam.; cataphylls lanceolate, thin, 4–8 cm long, acute at apex, brown, persisting intact, eventually deciduous. *Leaves* with petioles 19.5–38 cm long, ca. 3–7 mm diam., subterete, narrowly sulcate with rounded margins adaxially, rounded abaxially; geniculum darker than petiole, 0.6–1.5 cm long; blades subcoriaceous, ovate-elliptic, long-acuminate at apex, acute to semirounded at base, then narrowing abruptly to the geniculum (making geniculum seem remote from base by 4–11 cm), 26–40 cm long, 11–18 cm wide, broadest below or near the middle, the margins concave toward the base, apparently shallowly undulate; surface semiglossy, green to yellowish green; midrib narrowly convex above, sharply acute below; primary lateral veins 7–10 per side, departing midrib at 40–65° angle, ± straight, raised above and below, more sharply so below; tertiary veins weakly raised; reticulate veins obscure above, weakly raised below; collective vein arising from near the base to about the middle of the blade, equally as prominent as primary lateral veins, 5–15 mm from margin. *Inflorescences* with peduncle 31–57.5 cm long, ca. 3–4 mm diam., equaling or to 1.8× longer than petiole, light to olive-green, terete; spathe recurled, membranous, pale reddish green, oblong-lanceolate, to 8 cm long, ca. 0.7 cm wide, broadest near the base, narrowly acute at apex, acute and decurrent at base; stipe 1.5–3.5 cm long in front, (0)8–17 mm long in back; spadix dark red to brown, long-tapered, usually long-stipitate, 12–15 cm long, 4–5 mm diam. near base, ca. 2 mm diam. near apex; flowers ± square or rhombic when dried, 1.2–1.8 mm in both directions, the sides straight to smoothly sigmoid; 5–7 flowers visible in principal spiral, 8–9 in alternate spiral; lateral tepals 0.9–1.2 mm wide, the inner margins straight to broadly rounded, the outer margins 2-sided; pistils emergent, not raised; stigma ellipsoid, 0.5–0.7 mm long; anthers 0.2–0.3 mm long, 0.4–0.5 mm wide, inclined over pistil; thecae ovoid, slightly divaricate. *Infructescence* with spathe deciduous; spadix ca. 1 cm diam.; berries violet, (rehydrated) globose to oblong-ovoid, rounded at apex, 3.5–3.7 mm long, 2.6–3.5 mm diam.; pericarp somewhat thickened with moderately numerous pale raphide cells; seeds 1 or 2 per berry, brown, oblong-ovoid, somewhat flattened laterally, 2.5–2.8 mm long, 1.8–2 mm diam., 1.2–1.4 mm thick.

Anthurium krukovii is known from a few collections made in the central, northern and southwestern parts of Amazonas, Brazil, below 150 m, probably in a tropical moist forest life zone.

The species is characterized mainly by the shape of its leaf blades, which are rounded and abruptly attenuate at the base and narrowed even further to the geniculum in a manner that makes the latter seem remote from the base of the blade by 4–11 cm.

Anthurium krukovii is mostly closely allied to *A. atropurpureum* var. *arenicola*, which differs in having more coriaceous and usually narrower leaf blades which are long-attenuate (with more or less parallel margins) toward the base, and in having mostly shorter petioles. The same general differences apply to the typical variety of *A. atropurpurem*, which is smaller in overall size.

The occurrence of clear pustules on the undersurface of the dried leaf blades in the present species is of interest. The same feature occurs, albeit rarely, in *A. atropurpureum*, the presumed closest relative of *A. krukovii.* The two collections of *A. krukovii* which show this feature are *Byron et al. 621* and *Duarte 6958.*

The new name *Anthurium krukovii* honors Boris Alexander Krukoff, one of the first major American collectors to explore Amazonian Brazil, and whose philanthropy funds many important botanical functions to this day. In addition, Krukoff was the first known collector of the present species.

BRAZIL. AMAZONAS: Barcelos, *Duarte 6958* (RB); Rio Embira (tributary of Rio Tarauaca), 7°30'S, 70°15'W, *Krukoff 4927* (NY); Mpo. Maraa, Rio Japurá, vic. Maraa, Lago Maraa, *Plowman et al. 12211* (MO, INPA); Sitio Fortaleza, 7 km NW of Maraa, *Plowman et al. 12278* (INPA, NY); mouth of Igarape Maraa and Lago Maraa, *Plowman et al. 12380* (NY, INPA); Mpo. Tefe, Lago Tefe, Vila Nogueira, Porto Camanaus, *Byron et al. 621* (MO, INPA); Lago Tefe, NW shore, *Plowman et al. 12442* (MO, INPA).

Anthurium lanjouwii Jonk. & Jonk., Acta Bot. Neerl. 15: 133. 1966. TYPE: Surinam. Emma Mountains, S slope, 850 m, *Daniels & Jonker 1101* (holotype, U). Figure 348.

Terrestrial; stem to 15 cm long; internodes short, 1–1.5 cm diam.; roots moderately dense, spreading, to 25 cm long, the younger roots light brown, villous; cataphylls narrowly triangular, 3.4–5 cm long, persisting semi-intact toward apex, as fibers toward base. *Leaves* with petioles 7–23 cm long, drying 3–7 mm diam., subterete, sulcate adaxially, drying with sharp margins, rounded abaxially; geniculum sharply sulcate, 0.5–1 cm long; blades subcoriaceous, elliptic to ovate-elliptic, acuminate and apiculate at apex, obtuse to rounded or sometimes cuneate at base, 23–36 cm long, 12–19 cm wide, drying yellow-green to yellow-brown; midrib prominently riased on both surfaces, drying angular and paler than surface below; primary lateral veins 6–9 per side, departing midrib at 40–60° angle, moderately straight to the margin, then markedly ascending and merging with the margin or loop-connecting with the next higher vein, raised on both surfaces; tertiary veins drying prominulous below; collective vein lacking or arising below the middle of the blade. *Inflorescences* erect, shorter than leaves; peduncle 17–39 cm long; spathe promptly withering and soon deciduous, green tinged with purple, lanceolate, 2.5–4.5 cm long, 0.7–0.8 cm wide, inserted at ca. 45° angle on peduncle, mucronate at apex, acute at base; spadix purplish brown, weakly tapered, short-stipitate, 5–14 cm long, drying 4–6 mm diam.; flowers rhombic, 2.5–

3.3 mm long, 1.7–2.3 mm wide, the sides smoothly sigmoid parallel to spiral, jaggedly sigmoid perpendicular to spiral; 5–7 flowers visible in principal spiral; tepals matte and brown on drying; lateral tepals 0.8 mm wide, the inner margins rounded, the outer margins bluntly triangular; pistils not at all emergent; stigma linear, slitlike, to 0.8 mm long, stamens emerging in a regular sequence, held just above the tepals in a tight cluster above pistil, inclined over and obscuring the pistil; anthers 4 mm long, 5.5 mm wide; thecae ovoid, moderately divaricate. *Infructescence* unknown.

Anthurium lanjouwii is endemic to Surinam, known only from steep southern slopes of the Emma Mountains, on sandstone and dolomite, at 850 m.

This species is most closely related to *Anthurium bonplandii* and may prove to be only subspecific with that taxon. It differs from that species in being isolated geographically, having more or less elliptic blades and lacking plate-glands or pustules. It is geographically closest to *A. bonplandii* subssp. *guayanum*, which has much larger, oblanceolate to obovate blades with conspicuous dark glandular-punctations.

FRENCH GUIANA. Sommet Tabulaire, 40 km SE of Saül, 650–700 m, *Cremers 6469* (CAY). SURINAM. Emma Mountains, south, sandstone slope, 850 m, *Daniels & Jonker 1101, 1241, 1264* (U).

Anthurium latissimum Engl., Pflanzenr. IV. 23B(Heft 21): 292. 1905. TYPE: Peru. Junín: Prov. Tarma, La Merced, Río Chanchamayo, 1,000 m, *Weberbauer 1939* (holotype, B; isotype, MO-3122266). Figures 167–170.

Terrestrial or epiphytic; stem to 30 cm long, 2–3.5 cm diam.; roots dense, descending, white, fuzzy, short, ca. 3 mm diam.; cataphylls subcoriaceous, lanceolate to hook-shaped, 2-ribbed, 5–11.5 cm long, acute to acuminate at apex, drying reddish brown, persisting semi-intact, eventually as a reticulum of fibers. *Leaves* erect-spreading; petioles 8–48 cm long, 4–12 mm diam., sharply D-shaped to C-shaped, flattened to sulcate and with a medial rib adaxially, the margins sharply to bluntly raised or bluntly acute, rounded to 3–5-ribbed abaxially, the surface pale-short-lineate, sometimes tinged with purple; geniculum paler and thicker than petiole, becoming calloused and minutely transverse-fissured with age, 1–2 cm long; sheath 3–10 cm long; blades subcoriaceous, broadly oblanceolate to obovate-elliptic to broadly elliptic, acute to acuminate at apex, acute to attenuate at base, (26)50–125 cm long, 10.5–36.5 cm wide, broadest at or above the middle, the margins undulate, concave toward base; upper surface semiglossy, dark to medium green, lower surface semiglossy to weakly glossy, moderately paler; midrib above flat to bluntly raised at base, becoming sharply acute toward the apex and paler than surface, below bluntly acute at base, becoming broadly convex to acutely raised toward the apex; primary lateral veins 6–14 per side, departing midrib at 70–90° angle, retrorse to 130° toward the base, ± straight to arcuate ascending to the margin, raised above, bluntly convex below; interprimary veins not visible; tertiary veins weakly raised above, flat and darker than surface below; collective vein arising from near the base or near the apex, prominulous, 2–10 mm from margin. *Inflorescences* erect to spreading; peduncle (10)30–98 cm long, 2–9 mm diam., 1.2–4.6 × as long as petiole, green to reddish green, terete; spathe reflexed-spreading, sometimes recurled, subcoriaceous, sometimes reddish, usually green tinged with red or purple (B & K yellow 5/7.5), broadly lanceolate, (3.5)8–12(18) cm long, 1.3–2.5 cm wide, broadest near the base, inserted at 40–60° angle on peduncle, acute to acuminate at apex (the acumen apiculate), acute to rounded at base; spadix olive-green to gray-green to brownish to violet-purple (B & K red-purple 2/2.5), sometimes weakly glaucous, slightly tapered, sessile or stipitate to 2 cm, erect, straight to curved, held at ca. 180° angle from peduncle, 5–13(28) cm long, 4–7 mm diam. midway, 2–4 mm diam. near apex; flowers rhombic to 4-lobed, 2–2.3 mm long, 2 mm wide, the sides smoothly sigmoid to jagged; 7–10 flowers visible in principal spiral, 5–7 in alternate spiral; tepals minutely papillate, matte, white-pustulate; lateral tepals 0.5–0.6 mm wide, the outer margins 3–4-sided, the inner margins weakly curved; pistils papillate, minutely granulose, raised, red-violet to maroon; stigma linear, 0.4 mm long; stamens emerging in a regular sequence, the laterals preceding the alternates by 4–14 spirals, the 3rd stamen preceding the 4th by 5–7 spirals, arranged in a circle around the pistil; anthers pinkish to reddish brown, 0.5–0.7 mm long, 0.5–0.7 mm wide, thecae divaricate; pollen yellow fading to white, yeasty-scented. *Infructescence* with spathe persisting; spadix 9–17 cm long; berries maroon to deep red-violet (B & K red-purple 2/5), obovoid, flattened to depressed at apex, 6.5–7.5 mm long, 5–6 mm diam.; mesocarp transparent, gelatinous; seeds 2 per berry, white tinged with red-violet at base, 4.5–6 mm long, 2–3.5 mm diam.

Anthurium latissimum is endemic to Peru, where it ranges from San Martín to Huánuco, Junín, and

Ayacucho at 500 to 1,800 m in tropical moist, premontane moist, or tropical dry forest life zones.

This species is characterized by its usually long-petiolate blades which are rather abruptly attenuate in the lower third with concave margins, and especially by having the primary lateral veins in the lower part of the blade departing the midrib at a right angle to the midrib, or even markedly retorse toward the base, before arching upwards toward the margins.

Anthurium latissimum is perhaps most closely related to *A. ernestii*, which has generally smaller leaves that lack the retrorse or perpendicular veins, and usually occurs below 500 m.

Younger plants, represented by *Killip & Smith 24612* for example, may have small blades that are scarcely attenuate at the base. They also differ in having a stubbier spadix with only five to six flowers per spiral. Also noteworthy is *Croat 51171*, which dried greenish in contrast to most other, brown-drying material. It differs in no other respect.

While the tepals of most dried collections are at least sparsely papillate, a collection of cultivated origin believed to be this species (*Croat 52230A*) has densely granulose tepals which appear to be paler than those of most other collections.

PERU. Without locality, cultivated at MO: *Croat 52230A* (B, CAS, CM, F, K, M, MO, NY, P, RSA, S, US, USM). AYACUCHO: Huanta–Río Apurimac, Auina, 750–1,000 m, *Killip & Smith 22836* (NY, US). HUÁNUCO: Prov. Leoncio Prado. Tingo María Region, Lima-Tingo María, Km 504, Río Huallaga, 750 m, *Young & Sullivan 807* (MO); Km 478, 1,400 m, *Young & Sullivan 835* (MO); Dtto. Rupa Rupa, E of Tingo María, Cerro Quemado, 800–850 m, *Schunke 10498* (MO). JUNÍN: San Ramón–Oxapampa, 6 km N of turnoff to Satiapo, 700 m, 10°53′N, 75°18′W, *Croat 57727* (AAU, BM, MO, RSA, USM); Prov. Tarma, Tarma–San Ramón, Schunke Hacienda, La Merced, 1,300 m, *Macbride 5678* (F); Tarma–San Ramón, Schunke Hacienda, 1,400–1,700 m, *Killip & Smith 24589, 24612* (NY, US); Río Chanchamayo, La Merced, 1,000 m, *Weberbauer 1939* (B, MO); Río Vitoc, vicinity of Río Chanchamayo, ca. 1,000 m, *Soukup 4405* (US). SAN MARTÍN: Río Huallaga, Tingo María–Huánuco, 20 km from Tingo María, 625–1,100 m, *Allard 21977* (US); Prov. Lamas, Tarapoto–Moyobamba, 10 km NW of Tabalosos, 500 m, 6°15′S, 76°43′W, *Croat 51171* (MO, US); Prov. Mariscal Cáceres, Dtto. Uchiza, Tingo María–Tocache Nuevo, behind Ramal de Aspusana, 25.8 km N of turnoff to Tocache Nuevo from Tingo María–Pucalpa road, 500 m, 9°07′S, 76°03′W, *Croat 57967* (MO).

Anthurium lennartii Croat, sp. nov. TYPE: Ecuador. Loja: Celica–Zapotillo Road, ca. 3 km below Pózul, 1,400 m, *Harling & Andersson 18071* (holotype, MO 2908943; isotype, GB 897-61). Figure 171.

Planta epiphytica; internodia ca. 1.5 cm diam.; cataphyllum persistens in fibris tenuibus; petiolus 7–11.5 cm longus, 5–7 mm diam., D-formatus; lamina oblongo-elliptica, 55–98 cm longa, 10–17.5 cm lata, apice obtusa ad rotundata; pedunculus 20.5–37.5 cm longus, 3–4 mm diam.; spatha 7.5–9 cm longa, 1.5–2 cm lata; spadix lentiter contractus, 7 cm longus, 5–6 cm diam., viridis ad lilicinus; baccae rubentes ad atropurpureae.

Description based on dried material only. Epiphytic; stem ca. 1.5 cm diam.; roots moderately numerous, pale grayish, shortly pubescent, moderately elongate, ca. 2–3 mm diam.; cataphylls subcoriaceous, ca. 10 cm long, light brown, persisting as linear fibers, soon deciduous. *Leaves* with petioles 7–11.5 cm long, 5–7 mm diam., D-shaped, with the margins sharply raised adaxially, probably 2–3-ribbed abaxially; geniculum slightly thicker than petiole, sometimes fissured transversely, 0.8–1.5 cm long; sheath 3.5–5.5 cm long; blades subcoriaceous, oblong-elliptic, obtuse to semi-rounded at apex (the acumen shortly apiculate), obtuse to narrowly rounded at base, 55–98 cm long, 10–17.5 cm wide, broadest at or near the middle, both surfaces matte, green to yellowish; midrib convexly raised above, somewhat acute at base, becoming prominently convex toward the apex below; primary lateral veins 16–23 per side, departing midrib at (40)55–85° angle, arcuate to the collective vein, convexly raised above and below and paler than surface; interprimary veins moderately numerous, raised on both surfaces; tertiary veins weakly raised above and below; collective vein arising from the base or near the base, less prominent than primary lateral veins, raised above and below, 2–7 mm from margin. *Inflorescences* with peduncle 20.5–37.5 cm long, ca. 3–4 mm diam., 2.9–3.7× as long as petiole, greenish to yellowish green, probably terete; spathe apparently spreading, subcoriaceous, green, broadly linear to linear-lanceolate, 7.5–9 cm long, 1.5–2 cm wide, broadest near the base, abruptly acuminate at apex (the acumen inrolled), acute at base; stipe 13 mm long in front, 3 mm long in back; spadix green, weakly tapered, 7 cm long, 5–6 mm diam. near base, 4 mm diam. near apex, broadest at the base; flowers rhombic to 4-lobed, 1.6–1.9 mm long, 1.5–1.8 mm wide, the sides usually jaggedly sigmoid, sometimes smoothly sigmoid; 6–8 flowers visible in principal spiral, 5–6 in alternate spiral; tepals roughened; lateral tepals 1–1.3 mm wide, the inner margins erose, broadly convex, the outer margins 2-sided; pistils exposed, yellowish; stigma slitlike, dark, ca. 0.4 mm long; anthers 0.5–0.7 mm long, 0.7–0.9 mm wide; thecae ovoid to oblong-ovoid, 0.3–0.4 mm wide, not divaricate. *Infructescence* with spathe persisting; spadix 15.5–26 cm long, 2.2–2.5 cm diam., with tepals becoming enlarged and conspicuous, often purplish; berries red to dark purple, after rehydration ovoid to ovoid-ellipsoid, acute to ± rounded at apex, 6.3–8.5 mm long, 3.7–4.3 mm diam.; pericarp translucent with pale, linear raphide cells; mesocarp gelatinous, translucent, reddish; seeds 1–2 per berry, yellowish, ovoid to oblong-ovoid, flattened, 3–3.5 mm long, 2–2.7 mm diam., 1–1.5 mm thick, enveloped by gelatinous substance.

Anthurium lennartii is endemic to southern Ecuador, where it occurs in Loja Province, in lower montane moist to premontane dry forest life zones, at 1,400 to 2,700 m. It is expected in adjacent Peru.

This species is characterized by its greenish-drying, oblong-elliptic blades that are obtuse to narrowly rounded at the apex, its basally originating collective vein running fairly close to the margin, its moderately numerous primary lateral veins, and by its weakly tapered spadix. Unique features of *Anthurium lennartii* are its conspicuously accrescent, purplish tepals and red to purple berries.

Anthurium lennartii appears to be superficially similar to *A. manabianum*. The two species share in common general blade color on drying and spadix and spathe shape, but differ in blade shape and stipe length, which is up to 3 cm in *A. manabianum*. An important difference between these species is their distribution, with *A. lennartii* occurring in southern Andean Ecuador and *A. manabianum* in the coastal part of the country, in Manabí Province at 450 m.

Anthurium lennartii is also similar in its appearance to *A. sodiroanum* Engl., a member of sect. *Xialophyllium*, which vaguely resembles other species of sect. *Pachyneurium*. *Anthurium lennartii* differs from *Anthurium sodiroanum* by having shorter nodes, collective vein running closer to the margin, more prominent primary lateral veins, a slightly broader spathe, and an elevational range to 2,700 m.

The new species is named in honor of Lennart Andersson of the University of Göteborg, who collected, with Gunnar Harling, all known species of *A. lennartii*.

ECUADOR. LOJA: 8 km W of Celica on road to Alamor, 2,000 m, *Harling & Andersson 22159* (GB); Celica–Gauachanama, Km 8, 2,700 m, *Harling & Andersson 22302* (GB); Celica–Zapotillo, 3 km below Pózul, 1,400 m, *Harling & Andersson 18071* (GB, MO).

Anthurium leonianum Sodiro, Anales Univ. Centr. Ecuador 17(123): 256. Jan. 1903. TYPE: Ecuador. Imbabura: W slopes of Volcán Cotatachi, 0°22′N, 78°20′W, *Sodiro s.n.* (holotype, B; isotype, QPLS). Figures 172–174.

Terrestrial on rocky slopes; stem to 3 cm diam.; roots spreading-descending, whitish, appearing pubescent when fresh, thick, rather short, prominently tapered; cataphylls subcoriaceous, lanceolate, longer than petioles, acuminate at apex, drying brown, persisting as fine linear fibers. *Leaves* erect-spreading to spreading; petioles 5–22 cm long, 10–15 mm diam., D-shaped, flattened and with a medial rib to broadly and sharply sulcate adaxially with the margins prominently raised, 5–8-ribbed abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, 1–1.5 cm long; sheath 6–8 cm long; blades coriaceous, obtuse to acute at apex, rounded to acute at base, (23)43–101 cm long, 8–29 cm wide, broadest at or near the middle, the margins prominently undulate; upper surface matte to semiglossy, dark green, lower surface matte to weakly glossy, paler, both surfaces drying yellowish green; midrib flat at base, becoming acutely raised toward the apex and conspicuously paler than surface above, prominently higher than broad at base, becoming acutely raised toward the apex below; primary lateral veins 10–15 per side, departing midrib at 45–60° angle, ascending ± straight to near margin, then arcuate-ascending and merging with margin, prominently convexly raised above and below; tertiary veins prominulous when dried above and below; collective vein arising from near the apex, raised above and below when dried, usually less than 5 mm from margin. *Inflorescences* ± erect, equaling or longer than leaves; peduncle 46–91 cm long, 10–17 mm diam., 4–5 × as long as petiole, subterete to 1-ribbed; spathe reflexed, coriaceous, green, long-lanceolate, 29–35 cm long, 2–5 cm wide, broadest near base; spadix dark purple (pre-anthesis), becoming greenish brown, long-tapered, 23.5–42 cm long, 10–12 mm diam. near base, 5–7 mm diam. near apex; flowers 4-lobed, 2.2 mm long, 1.5 mm wide; 14–15 flowers visible in principal spiral, 7–9 in alternate spiral; tepals weakly and minutely papillate; pistils weakly emergent; anthers ca. 0.5 mm long. *Infructescence*, 2.5–3 cm diam.; berries dark purple at apex, obovoid.

Anthurium leonianum is endemic to Ecuador in the province of Imbabura from 900 to 1,500 m, in lower montane dry or premontane moist forest life zones.

This species is recognized by its thick, erect to spreading leaves which dry yellow-green, its petioles which are sharply sulcate adaxially and 5–8-ribbed abaxially, and by its long-tapered, deep purple spadix which becomes greenish brown at anthesis. It is also reported to have deep purple berries.

Anthurium leonianum might be confused with *A. dombeyanum*, which, in Ecuador, occurs only in the provinces of Loja and Tungurahua (only two collections are known from the latter province). *Anthurium dombeyanum* differs mainly in having the petioles rounded abaxially. In addition, the leaf blades of *A. leonianum* are conspicuously yellow-green on drying, while in *A. dombeyanum* they are usually brownish or dull grayish green. The spadix of *A. dombeyanum* is generally shorter than that of *A. leonianum*.

Anthurium leonianum also bears some resemblance to two species from central Colombia, *A. glaucospadix* and *A. caucavallense*. Both have, at least at times, yellowish green leaf blades on drying, though the color more closely approaches that of some specimens of *A. dombeyanum*. Although the cataphylls of the type specimen of *A. leonianum* at Berlin appear to be hooked and refolded, they are straight and lanceolate on living collections from the same area. It is here believed that the cataphylls of the type specimen are so shaped because of the way it was prepared. This character, along with the lower angle of the primary lateral veins (45–60 vs. 50–90°) and peduncle-petiole ratio (peduncles 4–5 vs. 1–2 times longer than the petioles in *A. leonianum*), serve to distinguish this species from *A. caucavallense*. *Anthurium glaucospadix* also differs in having the primary lateral veins depart the midrib at a broad angle, as well as in having a bluish green, glaucous spadix and red berries.

The name *Anthurium leonianum* was used in the Flora of Río Palenque (Dodson & Gentry, 1978), based on *Dodson & Tan 5389*, but that collection represents a new and unrelated species, *A. sparreorum*, described in the present treatment. The latter species has a thinner blade with the collective veins arising at the base and running close to the margin, whereas *A. leonianum* has a coriaceous blade with the collective vein arising from one of the primary lateral veins in the upper ¼ of the blade. A character that may be used to distinguish the two immediately is the number of primary lateral veins per side (10–15 in *A. leonianum* vs. (15)20–30 in *A. sparreorum*). *Anthurium sparreorum* is known from lower elevations, generally around 200–300 m in premontane wet forest.

ECUADOR. IMBABURA: Ibarra–Lita, 1,500 m, *Cobb 21 E* (MO, QCA); Salinas–Lita, 900–1,000 m, 0°45′N, 78°15′W, *Juncosa 2262* (K, MO); Tercer Paso, on San Lorenzo RR, 1,100 m, *Madison et al. 4960* (MO, SEL); Volcán Cotacachi, W slopes, *Sodiro s.n.* (B, QPLS); Río Meta, Ibarra–Lita, E of La Carolina, border of Carchí Prov., 1,090 m, *Croat 38986* (MO).

Anthurium lindmanianum Engl., Bot. Jahrb. Syst. 25: 367. 1898. TYPE: Brazil. Mato Grosso: Cupim near Palmeiras, *Lindman 2455 1/2* (lectotype, S). Figures 175–177.

Anthurium douradense Rizzo, Rev. Goiana Med. 16: 31–33. 1970. TYPE: Brazil. Goias: Serra Dourada, *Rizzo 4532* (holotype, UFG; isotype, RB).

Terrestrial or epilithic, rarely epiphytic; stem frequently creeping over ground, 1–5 cm diam.; roots moderately dense, descending, fuzzy, drying 2–4 mm diam.; cataphylls subcoriaceous, lanceolate, 2–9(15) cm long, acute to acuminate at apex, green, drying reddish brown, persisting ± intact or as coarse linear fibers. *Leaves* erect-spreading; petioles (2)11–57(65) cm long, (2)8–18 mm diam., bluntly to sharply D-shaped, flattened to slightly sulcate adaxially, rounded abaxially, the surface pale-speckled; geniculum slightly paler and thicker than petiole, (0.2)0.8–2 cm long; blades coriaceous to subcoriaceous, oblanceolate to broadly elliptic, acute to obtuse to short-acuminate at apex, cuneate-attenuate to obtuse to rounded, rarely shallowly cordate at base, (14)20–84 cm long, (4.2)12–29(34) cm wide, broadest usually above the middle, the margins usually flat, sometimes broadly undulate; upper surface glossy to semiglossy, medium green (B & K green 2/2.5), lower surface matte, paler; major veins sometimes paler on both surfaces; midrib convexly raised above, prominently and acutely raised below (about as high as broad); primary lateral veins (4)7–10(14) per side, departing midrib at (30)40–60(80)° angle, arcuate-ascending to the margin or to the collective vein, raised, sometimes becoming sunken toward margin above, raised below; tertiary veins weakly etched, and sometimes concolorous above, prominulous and darker below, conspicuously raised on both surfaces when dried; collective vein arising from about the middle to near the apex of the blade or absent, sunken above, weakly raised below, 5–13 mm from margin. *Inflorescences* erect to spreading, equaling or longer than leaves; peduncle (15)35–134 cm long, (1)2–12 mm diam., 1.3–2.3(14.6)× as long as petiole, terete; spathe spreading to reflexed, sometimes recurled, subcoriaceous, withering and/or deciduous, yellow-green (B & K yellow-green

8/10), lanceolate, (3)5–17 cm long, (0.5)1–2 cm wide, broadest near the base, inserted at 20–40° angle on peduncle, long-acuminate at apex (the acumen ca. 3 mm long), acute to obtuse at base; spadix pinkish to dull brownish olive-green to dark red or purplish violet, oblong, weakly tapered, sessile or stipitate to 4 cm, erect, (1.5)4–12(20) cm long, 3–7 mm diam. midway, 1.5–4 mm diam. near apex, moderately tapered; flowers 4-lobed, 1.8–3 mm long, 1.2–2.7 mm wide; (2)4–9 flowers visible in principal spiral, 4–10 in alternate spiral; tepals matte, minutely papillate; lateral tepals 0.9–2.2 mm wide, the inner margins straight to broadly rounded, sometimes minutely and unevenly erose, the outer margins 2–5-sided; pistils not emergent before anthesis, slightly raised at anthesis, caviform with erect, reddish margins; stigma linear becoming circular, 0.2–0.3 mm long; lateral stamens preceding the alternates by 2–16 spirals, the 3rd stamen preceding the 4th by 7–10 spirals; anthers 0.4–0.6 mm long, 0.4–0.7 mm wide, inclined over and obscuring the pistil; thecae ovoid-ellipsoid, not divaricate. *Infructescence* with spathe deciduous; spadix normally more than 15 cm long, bearing berries in the basal portion only; berries dark purple to dark red toward the apex, white below, obovoid, "hollow" when rehydrated, 7–9 mm long, 4–6 mm diam.; seeds 1–2 per berry, 5.5–6.8 mm long, 3–3.5 mm diam., 2–2.3 mm thick, weakly apiculate at both ends, pale-punctate.

Anthurium lindmanianum is known from Brazil in the states of Mato Grosso, Rondônia, Goiás and in the southern and central eastern parts of Pará at 90 to 1,000 m. It grows terrestrially in sandy soil, frequently along stream banks, among or on sandstone rocks, in gallery forest and scrub.

This species is recognized by its broadly elliptic or sometimes oblanceolate blades, which are rounded to abruptly acuminate at the apex, by its long-pedunculate inflorescence, and by its berries, which are purple at the apex and whitish at the base. It is also distinguished by its stem creeping over the surface of the ground and by its leaves being erect from the apex of the stem. The stem may even be subterranean. In cultivation, the species grows best when given direct access to water, e.g., when growing on a large brick placed in a pool of water. The appressed stem adheres closely to the brick (above the water line) in this situation.

Anthurium lindmanianum is most easily confused with *A. bonplandii* subsp. *bonplandii*, which occurs in the same state of Brazil (Pará). Typical specimens of *A. bonplandii* from Pará, all collected north of the Rio Amazonas, mostly differ in having conspicuous, dark brown plate glands on the undersurface of the leaf blades, and prominently raised tertiary venation on both leaf blade surfaces on drying. In contrast, the tertiary venation of *A. lindmanianum* is inconspicuous on the upper surface and generally less conspicuous on the lower surface on drying, and dark brown (or colorless) glandular punctations are normally not present and are not conspicuous where observed. In Pará, *A. lindmanianum* occurs in the area of the Serra dos Carajas in the central eastern part of the state, and in the Serra do Cachimbo (including the immediate lowlands to the north, i.e., the Rio Cururú) in the southwest. Thus, the species appears to prefer upland areas, a trend which continues toward the south, where it is more prevalent.

A few collections from Pará deserve mention, being rather markedly different from typical material and possibly meriting subspecific recognition once the taxon is better represented in herbaria by collections from this area. These collections, *Berg & Henderson 493*, *Bockerman 248*, *Sperling et al. 5658*, and *Secco et al. 136*, are all smaller than average for the species in all aspects and have a prominently stipitate spadix. In addition, the peduncle may be up to 14.6× larger than the petiole (vs. 1.3–2.3 times for typical material), and the spadix of two of these collections is reported as "black."

BRAZIL. Cultivated at Munich Bot. Gard., *Bogner 586* (MO); cultivated by Burle–Marx, *Croat 57174* (MO); cultivated at Tropic World, San Diego, California, *Croat 57157* (MO). GOIÁS: Rio Araguaia, 6 km NW of Piranhas, 700 m, *Irwin et al. 17703* (IAN, K, MO); Serra do Caiapo, 12 km S of Caiaponia, near small creek, 720 m, *Hutchison 8505* (MO); 48 km S of Caiaponia, 800–1,000 m, 17°12′S, 51°47′W, *Irwin & Soderstrom 7239* (MO, SEL), *Prance & Silva 59634* (K, NY); Serra Dourada, *Rizzo 4532* (RB, UFG); 1.3 km NW of junction with road to Mossâmedes on GO 070 from Goiania to Goías, 750–800 m, 15°57′S, 50°02′W, *Thomas et al. 5778* (NY). MATO GROSSO: 30 km ENE of Barra do Garcas, 450 m, *Anderson 9785* (RB); Chapada dos Guimaraes, above Veu da Noiva, 720 m, *Prance et al. 19164* (U); 5 km E of Chapada dos Guimaraes, road to EMBRATAL, 720 m, *Prance et al. 19375* (NY); 270 km N of Xavantina, 12°54′S, 51°22′W, *Gifford 146* (NY); Cerrado–Pantanal, Matas de Transição, 600 m, *Martinelli 366* (K); Serra Itapirapuan, *Lindman 2407 1/2* (cited by Engler (1898) as *2455 1/2*) (B, S); Araguaia, direção Rondopolis, *Hutchison 8548* (UEC); Fazenda Cachimbo, *Cordeiro 1087* (MG, US); base camp, 12°49′S, 51°46′W, *Harley et al. 10631* (K); Xavantina–São Felíx, 12°54′S, 51°52′W, *Ratter et al. 960, 966* (K); Xavantina, 12°54′S, 51°22′W, *Gifford 145, 146* (K); Ponte de Pedra, *Hatschbach & Koczicki 33205* (K); Cupim, near Palmeiras, *Lindman 2455 1/2* (S); Rio Juruena, Cachoeira Misericordia, *Rosa & Santos 1998* (MG, MO, NY); Serra Ricardo Franco, 700–800 m, 15°S, 60°W, *Windisch 1623* (K); Serra do Roncador, 84–85 km N of

Xavantina, 550 m, *Hunt 5800* (K), *Hunt & Ramos 5740* (K, NY), *Irwin et al. 16446* (GH, IAN, MO, TEX); Mpo. Jauru & Pontes e Lacerda, 38 km SE of Pontes e Lacerda on BR 174 to Cáceres, 15°27'S, 59°04'W, *Thomas et al. 4694* (NY); Mpo. Luciaria, 43 km S of Pto. Alegre do Norte, 1-5 km W of BR158, 11°17'S, 51°45'W, *Thomas et al. 4440* (MO); Mpo. Rondonopolis, Serra da Petrolina, *Hatschbach 34125* (K). PARÁ: Maraba, Alto da Serra, *Secco et al. 136* (MO); Rio Cururú, canal SE of Missão Cururú, Alto Tapajós, 140 m, 7°35'S, 57°31'W, *Anderson 10602* (NY); 2 hours downstream from Missão Cururú, Mouro, Alto Tapajós, 100–200 m, 7°15'S, 57°55'W, *Anderson 11080* (COL, K, MO, NY, U); Tapajós, *Rosa & Santos 1906* (MG, MO, NY); Serra do Cachimbo, Cachimbo, 500–600 m, 9°20'S, 54°53'W, *Bockermann 248* (UB), *Pereira 1821* (RB); Serra dos Carajás, Serra Norte, AMZA exploration camp, 600 m, 6°00'S, 50°15'W, *Berg & Henderson 493* (F, GH, INPA, MG, RB, US, WIS); 2 km W of AMZA Exploration Camp N-5, 700 m, 6°04'S, 50°08'W, *Sperling et al. 5658* (MG, MO); 20 km NW of Serra Norte mining camp, less than 500 m, 5°55'S, 50°26'W, *Daly et al. 1697* (INPA, MG, MO); Serra Norte, Maraba, Clareira N-1, *Cavalcante & Silva 2631* (MG), *Silva et al. 1631, 1866* (MG); Mpo. Itaituba, Serra do Cachimbo, 5 km from Cachimbo airport, along Rio Formiga, 500–600 m, 9°23'S, 54°55'W, *Silva et al. 135* (NY, INPA). RONDÔNIA: ca. 35 km WSW of Ariquemes, Mineraceo Taboca at Massangana, 10°02'S, 63°20'W, *Zarucchi et al. 2650* (F, INPA, MG, MO, NY, RB, US); 4 km from Ariquemes, BR-364, 200–500 m, 9°55'S, 63°06'W, *Vieira et al. 548* (MG, MO, NY).

Anthurium linguifolium Engl., Pflanzenr. IV. 23B(Heft 21): 162. 1905. TYPE: Ecuador. Manabí: between El Recreo and Agua Amarga, *Eggers 15530* (lectotype, B; isolectotypes, F, K). Figures 178, 180.

Terrestrial; stem to 19 cm long, ca. 1 cm diam.; roots dense, ascending, green to whitish, pubescent to smooth, short, 1–1.5 cm long, 5–6 mm diam.; cataphylls subcoriaceous, linear-lanceolate, 3–10.5 cm long, obtuse to acute or acuminate at apex, drying reddish brown (B & K yellow-red 4/10), persisting ± intact, splitting at base. *Leaves* erect-spreading; petioles 4–7 cm long, 5–7 mm diam., erect-spreading, subtriangular, convexly raised to obtusely ribbed, sometimes broadly sulcate adaxially, the margins sharply raised, somewhat rounded and sharply 1-ribbed abaxially, conspicuously swollen to 14 mm diam. at base; geniculum slightly paler and conspicuously thicker than petiole, 0.5–2 cm long; blades subcoriaceous, oblong-linear, acute, sometimes apiculate at apex, acute to rounded at base, 25–85 cm long, 2.5–6.5 cm wide, broadest at or near the middle, the margins broadly and shallowly undulate; upper surface matte to semiglossy, medium green, lower surface matte, conspicuously paler; midrib above obtusely raised at base, becoming sharply and acutely raised and higher than broad toward the apex, pale-speckled, slightly paler than surface, below acute throughout, paler and more yellowish than surface; primary lateral veins 8–15 per side, departing midrib at 30–60(–70)° angle, not well distinguished from interprimary veins, slightly arcuate to the margin, weakly sunken to weakly raised in shallow grooves, rather obscure above; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins obscure above, conspicuously darker than surface below, prominulous on both surfaces when dried; collective vein usually arising from near the apex, sometimes from near the base, obscure above, equally as prominent as interprimary veins below, 1–7 mm from margin. *Inflorescences* erect-spreading to spreading, shorter than or equaling leaves; peduncle 38–57 cm long, 4 mm diam., 7.6–19(38)× as long as petiole, green, terete; spathe spreading to reflexed-spreading, coriaceous, yellow-green, sometimes tinged with purple abaxially (B & K yellow-green 5/7.5), narrowly lanceolate, 7–8.5 cm long, 0.8–1.5 cm wide, broadest near the base, inserted at 45° angle on peduncle, acuminate at apex (the acumen inrolled), obtusely rounded at base; spadix glaucous, dull lavender-purple (B & K purple 5/2.5), sessile, slightly tapered, cylindroid, erect, 5–8.2 cm long, 7–9 mm diam. near base, 4–6 mm diam. near apex, broadest at the base; flowers 4-lobed, 2.1–2.6 mm long, (1.5)2.4–3 mm wide, the sides weakly sigmoid; (4)7–9 flowers visible in principal spiral, (3)5–7 in alternate spiral; tepals matte; lateral tepals 0.8–1.4 mm wide, the inner margins weakly concave to slightly rounded, the outer margins usually 2-, sometimes 3–4-sided; pistils emergent, bright green (B & K yellow 5/2.5); stigma ellipsoid, 0.3–0.4 mm long; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by 9 spirals, the 3rd stamen preceding the 4th by 3 spirals, borne at edge of tepals in a circle around the pistil; anthers straw-colored (B & K yellow-red 9/10), 0.6 mm long, 0.8 mm wide; thecae ovoid, slightly or not divaricate; pollen pale yellow (B & K yellow 9/2.5), sweetly scented at anthesis. *Infructescence* with persistent spathe; fruits not seen.

Anthurium linguifolium is known from only two collections made in coastal Ecuador in Manabí province, between Bahía de Caraquez and Canoa, near sea level in a very dry tropical forest life zone.

This species is characterized by its linear-oblong, weakly undulate blades, short petioles, rather elongate stem with short, more or less erect roots throughout its length (above ground) and by its glaucous, dull lavender-purple spadix.

The closest ally of *A. linguifolium* is *A. barclayanum.* The latter differs in greenish (rarely violet-purple) spadix, much larger size, longer petioles and oblanceolate blades. *Anthurium barclayanum* is sympatric with the present species at one locality at least, but they occur in very different habitats. The first is epiphytic, the second terrestrial in open areas. In addition, the ratio of peduncle to petiole length is much greater in *A. linguifolium* (7.6–19(38) vs. 3.5–6(9)).

ECUADOR. MANABÍ: 6 km N of Bahía de Caraquez, 3–4 km E of ocean, 50 m, 0°30′S, 80°22′W, *Croat 50697* (K, MO, NY, QCA, US); El Recreo–Agria Amarga, 0°29′S, 80°27′W, *Eggers 15530* (B, F, K, NY).

Anthurium llewelynii Croat, sp. nov. TYPE: Peru. San Martín: Prov. Tarapoto, Río Mayo, near Cumumbigue, 6 km S of Tarapoto–Moyobamba road at Km 15, 350 m, 6°23′S, 76°39′W, *Croat 51092* (holotype, MO 2819899; isotypes, B, K, M, NY, RSA, SEL, US, USM). Figures 181, 183–185.

Planta terrestris; internodia brevia, 2.5–4 cm diam.; cataphyllum lanceolatum, persistens in reticulum fibrarum; petiolus (5)21–40 cm longus, 3–7 mm diam., adaxile complantus, abaxile rotundatus; lamina oblanceolata ad anguste oblanceata aut elliptica, (29)50–110 cm longa, (5)7–15(20) cm lata, base plerumque abrupte rotundata vel subcordata; nervis primariis lateralibus 4–12 utroque; pedunculus 23.5–75 cm longus, 3–5 mm diam.; spatha lanceolata aut ovato-lanceolatae, 5–9 cm longa, 1–2.5 cm lata, viridis; spadix leviter contractus, 3.6–9 cm longus, 5 mm diam., olivaceus rubellus; baccae atropurpureae, globoso-obovoidae, 3–5 mm diam.

Usually terrestrial, rarely epiphytic; stem creeping, to 20 cm long; internodes short, 2.5–4 cm diam.; roots numerous, dense, descending, whitish, velutinous, 4–5 mm diam.; cataphylls subcoriaceous, lanceolate, 3–7 cm long, acute to acuminate at apex, drying brown (B & K yellow 3/7), persisting as a reticulum of fibers. *Leaves* erect-spreading to spreading; petioles (5)12–40 cm long, 3–8 mm diam., erect, sharply D-shaped, flattened to slightly convex adaxially, rarely with a medial rib, the margins sharply raised, rounded abaxially; geniculum paler than petiole, becoming calloused with transverse fissures, conspicuously thicker than petiole, 0.5–2 cm long, sometimes extending beyond leaf base up to ⅓ its length; sheath 2–6 cm long; blades subcoriaceous, oblanceolate to narrowly oblanceolate or elliptic, acute to acuminate at apex, narrowing toward the base, ending abruptly, obtuse to rounded or shallowly cordate at base, (29)50–110 cm long, (5)7–15(20) cm wide, broadest at or above the middle, the margins moderately to broadly undulate; upper surface glossy to semiglossy, occasionally matte, dark to medium green (B & K green 3/7.5), lower surface matte to semiglossy, considerably paler; midrib pale-speckled, conspicuously to scarcely paler than surface, broadly rounded-raised at base, becoming acutely angled toward the apex above, broadly rounded-raised to bluntly angled and slightly paler than surface below; primary lateral veins 4–12 per side, departing midrib at 35–90° angle (rarely retrorse to 110°), arcuate-ascending to the margin, convexly raised and paler than surface above, less prominently raised and darker than surface below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins obscure; collective vein arising from near the base or in the upper third of the blade, weakly raised above and below, 3–19 mm from margin. *Inflorescences* erect to spreading; peduncle 23.5–75 cm long, 3–5 mm diam., equaling to 5 × as long as petiole, green to brownish green, pale-speckled, terete to subterete; spathe spreading to reflexed, coriaceous to subcoriaceous, green, sometimes tinged with red at margins, lanceolate to ovate-lanceolate, 5–9 cm long, 1–2.5 cm wide, broadest near the base, inserted at 45–60° angle on peduncle, abruptly acuminate to acute at apex (the acumen inrolled), acute at base; spadix reddish olive-green, sessile, cylindroid, slightly tapered, erect or slightly curved, 3.6–9 cm long, 5 mm diam. midway, 3–4 mm diam. near apex; flowers rhombic to 4-lobed, strongly scented like rotting fruit, 1.5–3 mm long, 2–2.4 mm wide, the sides jaggedly sigmoid to straight; 4–8 flowers visible in principal spiral, 5–7 in alternate spiral; tepals matte, sparsely white-punctate, densely papillate; lateral tepals 0.6–0.8 mm wide, the inner margins straight to broadly convex, the outer margins 2–4-sided; pistils weakly raised, olive-green to maroon; stigma linear-oblong, caviform, 5 mm long; stamens emerging in a scattered pattern from the base, the laterals preceding the alternates by up to 17 spirals, the 3rd stamen preceding the 4th by 13 spirals, arranged in a circle around the pistil; anthers pinkish to yellow tinged with pink, 0.3–0.6 mm long, 0.5–0.9 mm wide; thecae oblong-ovoid, slightly divaricate; pollen yellow fading to white. *Infructescence* spreading-pendent; spadix 11–18 cm long, 1–1.3 cm diam.; berries dark purple (B & K red-purple 2/2.5), globose-obovoid to subglobose, truncate at apex, 5 mm long, 3–5 mm diam.; pericarp moderately thickened; mesocarp gelatinous, with raphide cells; seeds 1–2 per berry, brownish purple, oblong-ellipsoid, 4–5 mm long, 2.1–2.5 mm diam., 1.5–

2 mm thick, with a gelatinous appendage at both ends.

Anthurium llewelynii is endemic to Peru, known principally from an area of tropical dry and tropical moist forest in the vicinity of Tarapoto, at 130 m, and also in the vicinity of Tingo María in the Department of Huánuco to 750 m. The species is terrestrial, usually growing in sandy soil along streams, on exposed roadbanks, in shrub forests, or on rocky cliffs above riverbanks.

This species is characterized by its creeping stem, its comparatively long, sharply D-shaped, erect petioles, the usually markedly arching-spreading, narrowly oblanceolate blades (2.2–3.5, averaging 2.8 × longer than the petioles) which are usually abruptly and narrowly rounded to shallowly cordate at the base, as well as by the more or less green, moderately short, bluntly tapered spadix and dark purple fruits.

Anthurium llewelynii is not easily confused with any other species growing in the same area and habitats in which it occurs. Only *A. plowmanii* shares similar dry forest habitats in this region, but that species differs in having a peduncle equal to or shorter than the spadix, and a deeply sulcate petiole.

Anthurium tarapotense also occurs in the region, but occurs at slightly higher elevations (360–530 m) in a premontane moist forest life zone. It differs in being less robust and having a generally broader, short-petiolate blade which is attenuate at the base.

It is of interest that individuals of *A. llewelynii* brought into cultivation and grown in more mesic and crowded conditions may develop blades that are narrowly acute at the base, rather than the more characteristic narrowly rounded to subcordate condition. Compare, for example, vouchers prepared in the field and vouchers made from greenhouse plants, respectively, of *Croat 51092.*

Anthurium llewelynii is named in honor of Llewelyn Williams, who collected extensively in the Tarapoto area for the Field Museum in December 1929.

CULTIVATED. Originally from Selby 81-76-1, *Croat 57212* (B, MO). PERU. HUÁNUCO: Prov. Leoncio Prado, Tingo María Region, Río Huallaga, 750 m, *Croat 21086* (MO); Río Huallaga, near bridge and road to Monzón, 675 m, 9°15′S, 75°59′W, *Croat 50981* (MO, NY, RSA, US). SAN MARTÍN: Juanjui–Tarapoto, 35 km S of Tarapoto, 130 m, 6°46′S, 76°21′W, *Croat 58082* (AAU, CAS, CM, GH, K, MO, NY, USM); El Abra, 29 km S of Tarapoto, 450–540 m, 6°40′S, 76°20′W, *Gentry & Smith 45014, 45091A* (MO); Morales, W of Tarapoto, 360–900 m, *Williams 5721* (F); Tarapoto, 350 m, *Williams 5737, 6625* (F); Tarapoto–Yurimaguas, Km 5, *Kennedy 3545A* (ex cult.; = *Plowman 13300*) (F); Río Mayo, 6 km S of Tarapoto–Moyobamba road at Km 15, Cunumbigue, 350 m, 6°23′S, 76°39′W, *Croat 51092* (AAU, B, CM, DUKE, ENCB, IBE, JBGP, K, KYO, L. LE, M, MO, NY, RSA, SAR, SEL, TEX, US, USM); Puente Colombia–Shapaja, 280 m, *Plowman 6018* (GH); Río Shilcayo trail to Boca Toma del Shilcayo, N of Tarapoto, 400 m, 6°30′S, 76°22′W, *Knapp & Alcorn 7336* (K, MO); Dtto. Tarapoto, Tarapoto–Yurimaguas, km 13, 750–1,000 m, *Rimachi 5782* (MO).

Anthurium loretense Croat, sp. nov. TYPE: Peru. Loreto: Prov. Maynas, Dist. Iquitos, Río Momón and Quebrada Momoncillo, 1 km from the Río Nanay, 200 m, *Croat 51226* (holotype, MO 2813874-80; isotypes, B, CAS, DUKE, F, K, NY, US, USM, VEN). Figures 17, 182, 186.

Epiphytic; stem 15–50 cm long, (1)2.5–5 cm diam.; roots dense, spreading-ascending to spreading-descending, green-gray to whitish, puberulent to smooth, slender, ca. 1.5–7 cm long, 5–6 mm diam.; cataphylls subcoriaceous, sometimes coriaceous, 4–6 cm long, hook-shaped, sometimes cucullate at apex, green, drying brown (B & K yellow 4/5), persisting with apex remaining intact and as a reticulum of fibers at base. *Leaves* erect to spreading; petioles 2.5–10(16) cm long, 6–20 mm diam., ± D-shaped to quadrangular, flattened to sulcate with a medial rib and the margins sharply raised adaxially, 3–8-ribbed abaxially; geniculum slightly thicker than petiole, prominently fissured transversely with age, 0.7–3 cm long; sheath 2–8 cm long; blades coriaceous to subcoriaceous, obovate to oblanceolate to elliptic or sometimes spathulate, acute to obtuse at apex (the acumen apiculate), usually abruptly rounded to shallowly cordate, sometimes truncate or acute to attenuate at base, (36)56–120(168) cm long, 30–50(62) cm wide, broadest usually above the middle, the margins broadly undulate; upper surface semiglossy, dark to medium green (B & K yellow-green 4/7.5), lower surface semiglossy to sometimes matte, slightly paler; midrib flat to obtusely raised at base, becoming sharply acute toward the apex above, slightly paler than surface, acutely raised at base, becoming convexly raised toward the apex below; primary lateral veins 10–21 per side, departing midrib at (20)30–60° angle, ± straight to the margin, prominently raised above, slightly paler than surface, prominently convexly raised near the midrib below, becoming acutely raised toward the margin; interprimary veins obscure on both surfaces, prominulous when dried; reticulate veins obscure above, darker than surface below; collective vein arising in the upper third of the blade or absent, flat to weakly sunken above, 4–10(15) mm from margin. *Inflorescences* spreading to spreading-pendent, shorter than leaves; peduncle 25–80 cm long, (2)4–7 mm diam., 4–12(20)× as long as petiole, green to green tinged with maroon or purple-violet, terete; spathe erect to spreading-reflexed to recurled, coriaceous, occasionally subcoriaceous, green heavily tinged with maroon (B & K red-purple 2/7.5), lanceolate to oblong-linear, 5.5–24(35) cm long, 1.2–3m wide, broadest near the base, inserted at 75-80° angle on peduncle, obtuse to long-acuminate at apex, acute to weakly decurrent at base; stipe 3–11 mm long in front, ca. 1 mm long in back; spadix maroon to reddish violet (B & K red-purple 3/10), cylindroid, scarcely to long-tapered, weakly curved, 7.5–28 cm long, 6–11 mm diam. near base, 2–6 mm diam. near apex; flowers square or rhombic to 4-lobed, 1.3–2.1 mm long, 1.3–2.4 mm wide, the sides smoothly to jaggedly sigmoid; 7–13 flowers visible in principal spiral, 5–9 flowers visible in alternate spiral; tepals matte, densely and minutely papillate, with few droplets; lateral tepals 0.6–1 mm wide, the inner margins straight to broadly convex, the outer margins 2–4-sided; pistils emergent, not raised, purple to reddish; stigma linear, purplish violet, 0.3–0.7 mm long; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by ca. 18 spirals; anthers pinkish to orange-purple, 0.3–0.5 mm long, 0.2–0.7 mm wide, inclined over and obscuring the pistil; thecae oblong-ellipsoid to obovoid, slightly or not divaricate; pollen yellow, fading to white, faintly yeasty-scented. *Infructescence* pendent; spathe deciduous or persisting; spadix 24–46 cm long, 1.5–2 cm diam.; berries purple-violet, oblong; mesocarp juicy; seeds white.

Anthurium loretense is currently known mainly from Peru in Loreto (hence the name) and Ucayali Departments at less than 350 m in a tropical moist forest life zone. A few collections are also known from Napo and from Morona–Santiago in Ecuador, Amazonas, Pasco, and San Martín in Peru, near Leticia in southernmost Colombia, and southwestern Amazonas in Brazil.

This species is characterized by its hook-shaped cataphylls, D-shaped petioles, large, broadly elliptic-oblanceolate blades drying greenish brown to brown, and by its long-pedunculate, mostly pendent inflorescence with the spathe usually ⅔ or up to ¾ as long as the long-tapered, maroon to purplish violet spadix and often held parallel to it. Although the base of the leaf blade is normally shallowly cordate with several congested primary lateral veins per side (appearing basal), leaf blades of younger plants are frequently acute to attenuate at the base.

Anthurium loretense is probably most closely related to (and perhaps only subspecifically distinct from) *A. cataniapoense* from southern Venezuela. That taxon shares many features, including similar petioles, cataphylls and inflorescences. *Anthurium cataniopoense* differs, however, in having a generally much smaller and more slender spadix and a more slender peduncle. *Anthurium loretense* is also similar to *A. harlingianum*, of Ecuador and Colombia, which differs in occurring at 450 to 1,800 m and in having a mostly erect inflorescence averaging about 6 cm shorter than that of *A. loretense*. See under *A. harlingianum* for details.

An interesting species also apparently closely related to *A. loretense* is *A. vaupesianum*, known only from Amazonian Colombia. It differs most markedly from *A. loretense* by its small size, more obovate leaf blades, and proportionally more slender spadix.

One collection from near Iquitos (*Croat 19342*) is noteworthy. Though closest to *A. loretense* among the species in the area, it appears closer still to *A. harlingianum* because of its erect inflorescence, moderately stubby spadix and leaves drying a very similar brown color. However, it differs from both of the above species in having the spathe longer than the spadix. It perhaps represents a new species; *Williams 2465* from near Leticia, Colombia, appears to represent the same taxon.

Two further collections from Loreto (*Vásquez et al. 4882* and *Rimachi 5569*) possibly belong here. The Vásquez collection has a leaf blade only 54–62 cm long and petioles 17–21 cm long, and the Rimachi collection has a spadix (at anthesis) reported as green. In addition, both collections have blades long-attenuate toward the base (ending abruptly acute at the base) and shortly stipitate spadices. Another collection (*Smith 2881*) from Oxapampa in Pasco Department, Peru, appears to belong here as well, although it is very far removed from the known range of *A. loretense*. *Gentry et al. 29912* (perhaps a mixed collection) from near Iquitos, has leaf blades that are very long-attenuate in the lower third and narrowly acute at the base. It otherwise appears to belong here.

Mention should be made of several collections from the rather isolated valley of the Río Santiago and the adjacent Río Cenepa valley in Amazonas Department, Peru, the only ones known from this department. These differ in having more flowers per spiral (10–18 vs. 5–13) and relatively shorter peduncles (1.5–2 vs. 4–12(20)× longer than the petioles). Local names for these plants include "uyayugkunamu" and "kagkur nuka" (Huambisa tribe); "tukum" and "mun tukui" (Río Cenepa).

BRAZIL. AMAZONAS: Rio Jutai, 5°12'S, 69°00'W, *Traill 1138* (K). COLOMBIA. AMAZONAS: Quebrada Arara, 2 hr. N of Leticia near Río Amazonas, *Croat 7536* (MO, F). Puerto Nariño, Parque Nacional Amacayacu, 100 m, 3°45'S, 70°15'W, *Vásquez et al. 12504* (MO); Río Miritiparana, Caño Guacaya, 700 ft., 0°30'S, 70°40'W, *Schultes & Cabrera 16239* (GH). ECUADOR. MORONA-SANTIAGO: 35 km NE of Montalvo, 260 m, 1°49'S, 76°42'W, *Zak & Espinoza 4590, 4680* (MO). NAPO: Lago Agrio–Coca, ferry road 7.2 km S of Río Aguarico, 270 m, 0°02'N, 76°51'W, *Croat 58643* (MO, QCA); Lago Agrio–Río San Miguel, 5 km N of Lago Agrio, 280 m, 0°05'N, 76°55'W, *Croat 58689, 58691* (MO, QCA); 17.3 km N of Lago Agrio, *Croat 50344* (MO); Lago Agrio–Río San Miguel, 3 km from San Miguel, 350 m, *Besse et al. 1549* (SEL); Lago Agrio–Puerto El Carmen de Putomayo, vic. Tarapoa, 240 m, *Croat 58632A* (MO); Río Arajuno, Hacienda Aguinda, 450 m, 1°07'S, 77°36'W, *Marles EE 13* (MO). NAPO: Puerto Napo–Misahuallí, junction of Río Misahuallí and Río Napo, Vereda Venecia, 3.8 km W of Misahuallí, 370 m, 1°02'S, 77°42'W, *Croat 58895* (MO, QCA); Río Cuyabeno, 1.5 km upstream from Puerto Bolívar, 300 m, 0°06'S, 76°10'W, *Brandbyge et al. 33700* (AAU, MO); N of Laguna Grande, 265 m, *Poulsen 79710* (AAU); Parque Nacional Yasuní, 230 m, 0°52'S, 76°05'W, *Cerón 3354* (MEXU, MO, QCNE); 200 m, *Cerón & Gallo 4937* (MO, QCNE), *53396* (B, MO, QCNE); Añangu, in NW corner of park, 300 m, 76°22–23'W, 0°32'S, *Korning 47126* (AAU); Poso petrolero Daimi 2, 200 m, 0°55'S, 76°11'W, *Cerón & Hurtado 4096* (MO). PERU. AMAZONAS: Quebrada Chigkishinuk, *Kayap 282* (MO, US); Río Cenepa, Cenepa–Tuhushiku Creek, 700–800 ft., *Berlin 1874* (MO); Quebrada Huampami, vic. Kachaim, vic. Huampami, 5 km E of Chávez Valdivia, 200–250 m, 4°30'S, 78°30'W, *Kujikat 398* (MO); Río Santiago, Quebrada Caterpiza, 2–3 km behind community of Caterpiza, 65 km N of Pinglo, 200 m, *Huashikat 1343, 1869, 2343* (MO); 800 m below community of Caterpiza, trail from Mitayar, W side of Q. Caterpiza, 200 m, *Huashikat 487* (MO). LORETO: Quebrada Nawampa, 150 m, 4°30'S, 44°10'W, *Croat 17694* (MO); Quebrada Tahuayo, SSW of Tamshiyacu, *Croat 19743* (MO); Río Aguaytia, Aguaytia, 9°02'S, 75°30'W, *Croat 20947* (MO, USM); Río Nanay, Mishana, 120 m, *Solomon 3518* (MO); Prov. Alto Amazonas, Río Pastaza, Andoas, 210 m, 2°48'S, 76°28'W, *Gentry et al. 29672* (MO); Prov. Loreto, Río Tigre, Vista Alegre, 240 m, 2°40'S, 75°35'W, *Lewis et al. 12841* (MO); Prov. Maynas, Alpahuayo (Estación IIAP), *Vásquez et al. 5981* (MO); Iquitos Region, Río Itaya, Palo Seco, *Revilla et al. 2594* (F, MO); Iquitos–Nauta, 130 m, *Vásquez et al. 10696* (AMAZ, MO); Caserio de Nuevo Esperanza, 110 m, *Rimachi 5569* (IBE); Río Maniti, Recreo, NE of Iquitos, 115 m, 3°42'S, 72°50'W, *Vásquez & Jaramillo 1128* (MO); Río Momón, rear of Fundo Bohallo, 1 hr. upriver from mouth, 130 m, *Diaz & Jaramillo 78* (CM, K, M, MO); 1 km from the Río Nanay, Quebrada Mamoncillo, 220 m, 3°43'S, 73°20'W, *Croat 51225* (CAS, DUKE, K, MO, US, USM), *51226* (AAU, B, CM, K, MO, RSA, US, USM); below Balcon, ca. 95 m, *McDaniel & Rimachi 26283* (IBE); Río Amazonas, S of Iquitos, *Croat 19342* (MO, F); NE of Leticia (Colombia), Caballococha, 3°54'W, 70°32'W, *Williams 2465* (F); Quebrada de Sinchiqui below Santa María de Ojeal, *McDaniel & Rimachi 23873* (IBE); Dtto. Indiana, Explorama Inn, 220 m, 3° 23'S, 73°02'W, *Croat 61648* (AMAZ, MO); Río Amazonas, Quebrada del caserio de San Miguel, ca. 90 m, *Rimachi 5055* (IBE); Dtto. Yanamono, Indiana–mouth of Río Napo, Explorama Tourist Camp, 120 m, 3°28'S, 72°48'W, *Gentry et al. 29912* (CM, MO), *61651* (CM, MO), *Vásquez & Jaramillo 6321* (MO); 3°24'S, 72°49'N, 150–180 m, *Croat 61766, 61783* (AMAZ, MO), *Gentry et al. 36577* (MO); across Río Amazonas from Isla Yanamono, 150 m, *Croat 50126* (originally collected by Gentry, live at MO) (MO, U); Río Napo, Quebrada Sucusari, 130–140 m, 3°15'S, 72°55'W, *Gentry et al. 42695, 54535* (MO); Explor. Napo Camp, 130 m, 3°20'S, 72°55'W, *Vásquez & Jaramillo 11829* (MO, QCA), *11835* (MO); Quebrada Paparo, Río Manati, 110 m, 3°45'S, 72°55'W, *Vásquez & Jaramillo 11654* (MO); Explorama Llachapa Camp, Quebrada Sucusari, below Mazán, 140 m, *Gentry et al. 27737* (MO); Río Tamshiyacu, Caseria Alianza, 130 m, 4°05'S, 72°58'W, *Gentry et al. 29233* (BM, MO), *Vásquez & Jaramillo 4376* (MO); Puerto Alianza, 160 m, 4°08'S, 72°55'W, *Vásquez & Criollo 1836* (MO); Prov. Requena, Río Tapiche, Yarina, 180 m, 5°05'S, 73°50'W, *Vásquez et al. 4882* (MO); Jenaro Herrera, 140 m, *van der Werff et al. 10061* (MO). PASCO: Prov. Oxapampa, Iscozazin, 350 m, 10°11'S, 75°13'W, *Smith 2881* (MO). SAN MARTÍN: Tarapoto–Yurimaguas, km 55, NE of Pongo de Canarachi, 230 m, 6°15'S, 76°15'W, *Gentry et al. 52272* (MO).

Anthurium luteynii Croat, Selbyana 5(3–4): 324. 1981. TYPE: Panama. Veraguas: Río Primero Brazo, 2.5 km beyond Escuela Agrícola Alto Piedra, beyond Santa Fe, 700–750 m, *Croat 25521* (holotype, MO 2827506-08; isotypes, B, C, CAS, CM, CR, DUKE, F, K, M, MEXU, NY, PMA, SEL, UCLA, US, VEN). Figures 18, 187–189, 195.

Epiphytic or terrestrial; stem short; roots descending, whitish green, smooth to weakly pubescent, blunt at apex, 2–5 mm diam.; cataphylls subcoriaceous, elliptic, 10–28 cm long, minutely apiculate and inequilateral at apex, drying tan, persisting intact, soon dilacerating into reticulum of fibers. *Leaves* erect to spreading; petioles 9–50 cm long, 1.3–2.5 cm diam., ± trapezoidal to thicker than broad, flattened to weakly sulcate, sometimes with weak rib diminishing toward the base adaxially, the margins prominently and sharply raised, sharply and prominently 1–3-ribbed abaxially, the surface minutely pale-speckled; geniculum much thicker and paler than petiole, 1–3 cm long; blades thickly coriaceous, oblong-elliptic to oblong-oblanceolate, gradually to abruptly acuminate at apex (the acumen apiculate), acute to obtuse at base, 50–125 cm long, 9–33 cm wide, broadest near or above the middle; upper surface weakly glossy to semiglossy, dark green, lower surface matte, paler; midrib flat at base, becoming convexly raised toward the apex, much paler than surface above, prominently higher than broad and sharply 1–3-ribbed at base below, gradually becoming prominently and obtusely to acutely angular and eventually convex toward the apex, paler than surface; primary lateral veins 10–25 per side, departing midrib at 60–70° angle, slightly arcuate-ascending, weakly raised in grooves above, narrowly and convexly raised below; interprimary veins sunken above, flat or slightly raised and darker than surface below; tertiary veins obscure above, darker than surface below; collective vein arising from near the base, sometimes in the upper third of the blade, sunken or ± obscure above, weakly raised to flat and darker than surface below, 3–10 mm from margin. *Inflorescences* erect-spreading and slightly arching, equaling or shorter than leaves; peduncle 49–85 cm long, 1.3–2 cm diam., 0.5–3(6.6)× as long as petiole, green to violet-purple, with prominent rounded rib adaxially, more prominently ribbed abaxially; spathe erect to cucullate, hooding the spadix, coriaceous, dark purple, narrowly ovate to oblong-lanceolate, 9–33.5 cm long, 2–11 cm wide, broadest in the lower third, inserted at 60° angle on peduncle, acuminate at apex (the acumen caudate, to 15 mm long), decurrent at base; spadix violet-purple to maroon, shortly tapered toward apex (occasionally toward both ends), 7–18 cm long, 8–28 mm diam. near base, 5–17 mm diam. near apex; flowers rhombic to slightly 4-lobed, 2–3.6 mm long, 1.8–3 mm wide, the sides straight to jaggedly sigmoid; ca. 15 flowers visible in either spiral; tepals matte to semiglossy, minutely punctate, covered with dust-like waxy bloom; lateral tepals 1.2–1.5 mm wide, the inner margins turned up against pistil; pistils exserted ca. 0.5 mm, green at base, purplish brown at apex; stigma 1 mm long, droplets copious, appearing 3–4 weeks before stamens emerge; stamens emerging in a scattered pattern throughout spadix, lateral stamens emerging to apex before alternates start emerging; anthers creamy, 0.4–0.5 mm long, 0.6–1 mm wide; thecae ellipsoid, slightly divaricate; pollen yellow-orange fading to white. *Infructescence* erect or spreading; spathe cucullate and withered; spadix 20–25 cm long, to 4 cm diam.; berries orange to yellow (B & K yellow 8/25), oblong-ellipsoid to obovoid, acute at apex, 8.9–19 mm long, 5–8 mm diam.; pericarp thickened, transparent in lower half with few raphide cells; mesocarp mealy, orange; seeds 2 per berry, tan, oblong, 4–6.5 mm long, 2–2.7 mm diam., ca. 2 mm thick, weakly beaked at both ends.

Anthurium luteynii is known only from Panama, on both slopes of the Continental Divide, in tropical wet and premontane rainforest life zones at elevations of 530 to 1,350 m.

This species is characterized by its coriaceous, more or less narrowly oblanceolate leaves and its somewhat trapezoidal petiole that is prominently three-ribbed abaxially and sharply sulcate adaxially. Also characteristic is the stout, semi-erect inflorescence with a broad, often cucullate, purplish spathe and violet-purple spadix and the long, sharply pointed, orange berries.

Although initially confused with *Anthurium seibertii* because of its orange, pointed berries and coriaceous, persistent, intact cataphylls, *A. luteynii* is not believed to be closely related to that species or to any other known species. *Anthurium seibertii* differs from *A. luteynii* principally in having thinner, strap-shaped leaves with the collective vein always arising from near the base, and in having a narrowly tapered, much paler violet-purple spadix.

PANAMA. BOCAS DEL TORO: Fortuna Road, Gualaca–Chiriquí Grande, 33 km from Gualaca, 530 m, 8°36′N, 82°19′W, *Hoover 1334* (MO). COCLÉ: N of El Valle de Antón, trail to Las Minas, 800–900 m, *Luteyn 3162* (DUKE, MO); El Copé Region, sawmill 7 km NE of El Copé, 600 m, *Antonio 1140* (MO); Alto Calvario above El Cope, 8°39′N, 80°36′W, *Croat 68773* (MO); El Valle Region, Cerro Gaital, N slopes of mountain near La Mesa, N of El Valle, 800–900 m, 8°40′N, 80°7′W, *Knapp & Dressler 4881* (MO); El Valle de Antón, La Mesa, *Folsom 2785* (MO); El Valle de Antón, 2 km W of Cerro Pilón, La Mesa, 860–900 m, *Croat 37416* (MO); beyond La Mesa, toward Los Llanos, *Luteyn 3163* (DUKE). DARIÉN: Río Tuquesa headwaters, 2 km by air from Continental Divide, upper gold mining camp of Tyler Kittredge, 700 m, *Croat 27120, 27156, 27169* (MO). PANAMÁ: Cerro Jefe, ridge above Altos de Azul to Río Chagres, 9°15′N, 79°30′W, *McPherson 11900* (MO). VERAGUAS: Santa Fe Region, vic. Escuela Agrícola Alto Piedra, 735–770 m, *Croat & Folsom 33993* (MO), *Hammel 4669* (MO), *Mori & Kallunki 4751* (MO); Río Santa María, road from Santa Fe, *Witherspoon & Dressler 8923* (MO); Cerro Tute, 830–1,150 m, *Croat 48909* (MO); *D'Arcy 14982* (MO); Río Primero Brazo, 2.5 km beyond school 700–750 m, *Croat 25521* (B, C, CAS, CM, CR, DUKE, F, K, M, MEXU, MO, NY, PMA, SAR, SEL, UCLA, US, VEN), *48990* (MO), *49071* (FTG, MO); NW of Santa Fe, W fork of road beyond school, 1,300 m, *Croat 49044* (CM, ENCB, IBE, K, MO, VDB).

Anthurium machetioides Matuda, Anales Inst. Biol. Univ. Nac. Mexico 22: 379, fig. 7. 1952. TYPE: Mexico. Oaxaca: Chinantia, 1,200 m, *Ramírez 144* (holotype, MEXU). Figure 190.

Description based on dried material only. Stem short; cataphylls thin, to 6.5 cm long, drying brown, persisting as linear fibers, probably deciduous. *Leaves* with petioles 6–7 cm long, 4–5 mm diam., broadly sulcate adaxially, rounded abaxially; geniculum 0.4–0.5 cm long; blades, oblanceolate, narrowly acuminate at apex, narrowly cuneate at base, 45–48 cm long, 6–8 cm wide, broadest above the middle, both surfaces matte; midrib prominently and narrowly raised above and below; primary lateral veins 10–15 per side, departing midrib at 20–30° angle, arcuate to the collective vein; reticulate veins prominulous; collective vein arising from one of the lowermost primary lateral veins, 3–4 mm from margin. *Inflorescences* equaling or longer than leaves; peduncle 40–48 cm long, to 5 mm diam., terete; spathe narrowly lanceolate, inserted at 45° angle on peduncle; spadix greenish, glaucous, long-tapered, 20–24 cm long, 13 mm diam. near base, 6 mm diam. near apex; flowers rhombic, 2–2.4 mm long, 2.4–2.6 mm wide; 13–14 flowers visible in principal spiral, 9–10 in alternate spiral; pistils not emergent; stigma ellipsoid, slitlike, 0.5 mm long; stamens emergent, held at edge of tepals; thecae ovoid.

Anthurium machetioides is endemic to central Mexico on the Atlantic slope. The type was from the region of Chinantla in northeastern Oaxaca (a region comprising parts of four districts south of Valle Nacional), at 1,200 m in "selva baja caducifolia," and a second collection was made relatively nearby at 200 m in the District of Tuxtepec (between Valle Nacional and Tuxtepec).

This species is characterized by its oblong-linear leaves with a collective vein arising from near the base, primary lateral veins that are scarcely more prominent than the tertiary veins, and a very elongate, gradually tapered spadix.

In describing this species Matuda posited its relationship as sect. *Leptanthurium*; however, despite the fact that it has a collective vein arising from the base, its affinities are more likely with *Anthurium schlechtendalii*, which often has a collective vein from near the base in juvenile leaves. It differs from *A. schlechtendalii* in its proportionally narrow leaves, the presence of a collective vein, and in its proportionally much longer spadix.

MEXICO. OAXACA: Chinantla, 1,200 m, *Ramírez 144* (MEXU); Dist. Tuxtepec, Chiltepec, 200 m, *Martínez-Calderón 844* (LL, MICH).

Anthurium maguirei A. Hawkes, Bull. Torrey Bot. Club 75: 633. 1948. TYPE: Surinam. Table Mountain, 564 m, *Maguire 24218* (holotype, NY; isotypes, F, US). Figure 191A.

Description based on dried material only. Terrestrial or epiphytic; stem moderately elongate, horizontally creeping; internodes short, 0.8–1 cm diam.; roots moderately few, brownish, smooth, moderately slender and elongate, ca. 2–3 mm diam.; cataphylls broadly triangular, 1.5–3.5 cm long, acute at apex, reddish brown to dark brown, persisting intact. *Leaves* with petioles 4.5–21 cm long, ca. 2–3 mm diam., apparently subterete or C-shaped, sharply and narrowly sulcate adaxially, rounded abaxially; geniculum slightly thicker than petiole, 0.3–0.7 cm long; blades coriaceous, oblong-ovate to broadly elliptic, obtuse at apex (the acumen apiculate), rounded (occasionally obtuse) at base, 9.5–16 cm long, 2.8–5.7 cm wide, broadest at or below the middle; both surfaces matte, yellowish brown; midrib apparently acutely raised above, convexly raised below; primary lateral veins 5–8 per side, departing midrib at 30–45° angle, arcuate, probably flat or weakly sunken above, raised below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins weakly raised below; collective vein arising from near the apex, sunken above, raised below, equally as prominent as primary lateral veins, 2–6 mm from margin. *Inflorescences* longer than leaves; peduncle 22–26.5 cm long, ca. 2–3 mm diam., 3.1–5.5 × as long as petiole, terete; spathe probably spreading or reflexed, subcoriaceous, green, lanceolate, 3–4 cm long, 0.6–0.8 cm wide, broadest near the base, acuminate at apex (the acumen inrolled, 1–2 mm long), acute at base; stipe 2–2.2 cm long in front, 1.7–1.8 cm long in back; spadix green, cylindroid, 4.3–4.5 cm long, 4 mm diam.; flowers square, 2–2.4 mm in both directions, the sides straight to smoothly sigmoid; 5–6 flowers visible in principal spiral, 3–4 in alternate spiral; tepals apparently smooth; lateral tepals 1.2–1.5 mm wide, the inner margins straight, the outer margins 2-sided; pistils exposed; stigma linear, 0.2–0.3 mm long; anthers 0.4 mm long, 0.5 mm wide, inclined over and obscuring the pistil; thecae oblong-ovoid, slightly divaricate. *Infructescence* not seen.

Anthurium maguirei appears to be a local relict of the Guiana Shield flora, known only from Table Mountain in Surinam at 564 to ca. 1,000 m. It has been recorded as growing terrestrially in a "marshy" area as well as "terrestrial/epiphytic, climbing," although the last attribution is dubious.

This species is characterized by its very small size, moderately elongate stem and more or less elliptic leaf blades. It is one of the most distinctive species within sect. *Pachyneurium* and is unlikely to be confused with any other. Its presumed closest ally is *A. bonplandii* subsp. *bonplandii*, which is much larger in overall size and occurs further to the west at lower elevations.

Anthurium yutajense is another relict species of the Guiana Shield which superficially resembles *A. maguirei*. The former is placed provisionally in sect. *Urospadix* because its leaf blades have a collective vein originating at the base, while leaves of *A. maguirei* have free-ending (except near the apex) primary lateral veins.

SURINAM. Table Mountain, 564 m, *Maguire 24218* (F, NY, US); Tafelberg, *Herbarium Suriname Forest Service 16571* (MO, U).

Anthurium manabianum Croat, sp. nov. TYPE: Ecuador. Manabí: Portoviejo–Pichincha, 12 km E of San Plácido, 450 m, *Harling & Andersson 24750* (holotype, GB 1304-9, 1304-10). Figures 191, 192.

Planta terrestris aut epiphytica; petiolus 22 cm longus, 6–8 mm diam., complanatus; lamina late oblanceolata, 95.5 cm long, 27 cm lata; pedunculus 24 cm longus; stipes 2.5–3 cm longus; spadix cylindricus, 6.5–10 cm longus, 4 mm diam., purpureo-brunneus.

Description based on dried material only. Terrestrial; stem, roots and cataphylls unknown. *Leaves* spreading; petioles 22 cm long, 6–8 mm diam., apparently flattened adaxially, with sharply raised margins; geniculum slightly darker and scarcely thicker than petiole, 1 cm long; sheath 3 cm long; blades chartaceous (probably young), broadly oblanceolate, shortly acuminate at apex, long-attenuate at base, 95.5 cm long, 27 cm wide, broadest in the upper third, the margins slightly sinuate; both surfaces nearly matte, gray-green; midrib weakly and convexly raised toward the base, more prominently raised toward the apex above, prominently convex below; primary lateral veins ca. 27 per side, departing midrib at 40–50° angle, straight to the collective vein, convexly raised above, less conspicuously so below; interprimary veins absent except near the apex, almost as conspicuous as primary lateral veins; tertiary veins obscure above, weakly visible below; reticulate veins not visible; collective vein arising from near the base, as conspicuous as larger tertiary veins, 2–8 mm from margin. *Inflorescences* spreading; peduncle 24 cm long, 2 mm diam., 1.1 × as long as petiole, green, terete; spathe erect-ascending, chartaceous, green with numerous, conspicuous raphide cells, oblong-elliptic, 9–10 cm long, 1.3–1.5 cm wide, broadest at or near the middle, acuminate-caudate at apex (the acumen 10 mm long), obtuse-rounded at base; stipe 2.5–3 cm long; spadix purplish brown, cylindroid, moderately curved, semi-erect, held at ca. 30–40° angle from peduncle, 6.5–10 cm long, 4 mm diam. throughout or 3 mm diam. near apex; flowers square, 1.2–2 mm long, 1.5–2 mm wide, the sides straight to smoothly or jaggedly sigmoid; 3–5 flowers visible in principal spiral, 5–8 in alternate spiral; tepals very weakly papillate; lateral tepals 0.9–1.1 mm wide, the inner margins rounded, weakly erose, the outer margins 3-sided; pistils not visible; stamens ± erect; filaments exserted 0.2–0.4 mm; anthers brownish yellow, 0.5–0.6 mm long, 0.2–0.4 mm wide; thecae oblong-ellipsoid, not divaricate. *Infructescence* not seen.

Anthurium manabianum is known only from the type specimen, collected in Ecuador in Manabí Province (hence the name) in a premontane wet forest life zone at 450 m.

This species is characterized by its broadly oblanceolate, thin, greenish drying blades which are shortly acuminate at the apex and attenuate at the base, and by its small, long-stipitate, weakly tapered, purplish brown spadix.

Anthurium manabianum appears to be superficially similar to *A. lennartii*; see discussion of that species for details.

ECUADOR. MANABÍ: Portoviejo–Pichincha, 12 km E of San Plácido, 450 m, *Harling & Andersson 24750* (GB).

Anthurium manuanum Croat, sp. nov. TYPE: Peru. Madre de Dios: Manú, Salvación a Gloria, 710 m, *Vargas 17747* (holotype, CUZ). Figure 192A.

Planta epiphytica; internodia ad 1.5 cm diam.; cataphyllum persistens intactum apud nodos superiores; petiolus 4.5–9 cm longus, 3–4 mm diam., D-formatus, adaxile sulcatus, margine et costa media manifeste elevata; lamina subcoriacea, oblanceolata, 26–39 cm longa, 7–12 cm lata. Inflorescentia tam longa quam petioli; pedunculus 8 cm longus; spatha linearis-lanceolata, 4–5 cm longa, 8 mm lata; spadix glaucus, cylindricus, 4.2 cm longus, 3–4 mm diam. Baccae ignotae.

Description based on dried material only. Epiphytic; stem 1.5 cm diam.; roots brownish gray, densely woolly-pubescent, elongate, at least 3 cm long, 1–1.5 mm diam.; cataphylls probably subcoriaceous, 3–7.5 cm long, acuminate at apex, brown to brownish gray, persisting intact at least at the upper nodes, probably persisting as a reticulum of fibers on the lower ones. *Leaves* erect to spreading; petioles 4.5–9 cm long, 3–4 mm diam., ± D-shaped, sulcate with the margins and medial rib prominently raised adaxially, ± rounded abaxially; geniculum slightly darker than petiole, ca.

0.5–0.9 cm long; sheath 1.5–2.3 cm long; blades subcoriaceous, oblanceolate, acuminate at apex (the acumen ca. 2 cm long, apiculate), long-attenuate at base, 26–39 cm long, 7–12 cm wide, broadest above the middle, the margins probably undulate; upper surface matte, lower surface matte to semiglossy, both surfaces tan to dark brown; midrib prominently convex at base, becoming sharply acute toward the apex above, convexly raised and slightly darker than surface below; primary lateral veins 6–7 per side, departing midrib at 50–55° angle, straight, becoming arcuate-ascending to the margin or to the collective vein in the upper third of the blade, prominently raised above, flat to weakly raised below, slightly paler than surface; interprimary veins few, weakly raised above and below; tertiary veins prominulous, very weakly raised above and below; collective vein arising from near the apex, very weakly raised above and below, 4–7 mm from margin. *Inflorescences* erect, much shorter than leaves; peduncle 8 cm long, 1–2 mm diam., about equalling petiole, dark brown; spathe reflexed, subcoriaceous, brownish, linear-lanceolate, 4–5 cm long, 0.8 cm wide, broadest near the base, acuminate at apex, acute at base; stipe ca. (2)7 mm long in front, 1–2 mm long in back; spadix grayish brown, glaucous, cylindroid, held at 150° angle from peduncle, 4.2 cm long, 3–4 mm diam.; flowers rhombic, 1.9–2.3 mm long, 1.5–1.8 mm wide, the sides jaggedly sigmoid, sometimes straight; 6–7 flowers visible in principal spiral, 4–6 in alternate spiral; tepals densely papillate; lateral tepals 1.2–1.4 mm wide, the inner margins straight, occasionally broadly convex, pale, erose, the outer margins 2–3-sided, a few 4-sided; pistils with exposed area 0.6–1 mm diam., ± square; stigma ± ellipsoid; anthers yellowish, ca. 0.6 mm wide. *Infructescence* not seen.

Anthurium manuanum is known only from Peru in the Department of Madre de Dios, in the Manú region (hence the name), at 260 to 840 m. It probably occurs in a subtropical moist forest life zone.

This species is distinguished by its short peduncle (about as long as the petioles), green, oblong-lanceolate spathe and short, oblong, glaucous spadix, with the tepals having more or less erose margins.

Anthurium manuanum is most likely to be confused with, and is perhaps most closely related to, *A. uleanum*, which occurs further to the north. *Anthurium uleanum* differs in having much longer petioles and peduncles and a longer, more slender spadix. *Anthurium manuanum* may also be confused with *A. ernestii*, but differs mainly in having a conspicuously glaucous spadix.

PERU. MADRE DE DIOS: Manú, Salvación a Gloria, 710 m, *Vergas 17747* (CUZ); Prov. Manú, Cerro de Pantiacolla, Río Palotoa, 10–15 km NNW of Shintuya, 840 m, 12°35′S, 71°18′W, *Wachter 54* (F); Manú National Park, Cocha Cashu uplands, 400 m, 11°45′S, 71°0′W, *Nuñez 5769* (MO); Tambopata, Comunidad Nativo de Infierno, Hermosa Chica, 260 m, 12°49′S, 69°20′W, *Alexiades & Pesha 972* (NY).

Anthurium martianum K. Koch & Kolb in K. Koch, Wochenschr. 11: 276. 1868. TYPE: Surinam? Cultivated. Engler's Araceae Exsiccatae #165 (lectotype, B; isolectotypes, GH, P). Figures 194, 194A, 196.

Habit unknown; stem short; internodes to 2.5 cm diam.; roots spreading, rather short, tapered; cataphylls coriaceous, oblong-lanceolate, to 12 cm long, acuminate at apex, drying tan, persisting semi-intact. *Leaves* erect-spreading; petioles (11)20–37 cm long, 5–12 mm diam., obtusely and narrowly sulcate adaxially, rounded abaxially; geniculum thicker than petiole, 3–4 cm long; blades (dried) subcoriaceous, oblong-elliptic to oblong-lanceolate, acuminate at apex (the acumen thick and inrolled), rounded to truncate (34)43–103 cm long, (6)20–38 cm wide, broadest slightly below or at the middle, the margins weakly undulate; upper surface semiglossy, dark green, paler below, both surfaces drying greenish gray to brownish; midrib raised above, slightly paler than surface, convexly raised below; primary lateral veins 18–24 per side, departing midrib at 55–85° angle, weakly curved to the collective vein, raised above and below; interprimary veins less conspicuously raised than the primary lateral veins; tertiary veins weakly raised above and below; collective vein arising from near the base, weakly raised above and below, 5–35 mm from margin. *Inflorescences* (dried) with peduncle 25–60 cm long, 4–7 mm diam., ca. 0.7–1 × as long as petiole, terete; spathe spreading to reflexed, subcoriaceous to coriaceous, green, lanceolate, 9.5–17 cm long, 1.5–4 cm wide, broadest near the base, inserted at 60° angle on peduncle, acuminate at apex (the acumen tightly inrolled, ca. 6 mm long), rounded at base; spadix maroon, subsessile, tapered, weakly curved, held at 150–165(185)° angle from peduncle, 9–15 cm long, 7–11 mm diam. near base, 3–4 mm diam. near apex; flowers rhombic, 1.9–2.6 mm long, 1.6–2.1 mm wide, the sides mostly straight to smoothly or jaggedly sigmoid; 11–12 flowers visible in principal spiral, 12–18 in alternate spiral; tepals minutely and densely papillate when dried; lateral tepals 1.1–1.5 mm wide, the inner margins convex, weakly erose, the outer margins 2–3-sided; pistils ca. 0.8 mm long, 0.5 mm wide; stigma oblong, 0.4–0.6 mm long; thecae oblong, slightly or not divaricate; pollen fading to cream-white. *Infructescence* not seen.

Anthurium martianum is known from a single live collection, purportedly from Surinam, that was propagated at the botanical gardens in Berlin, Kiel, and Munich. The herbarium material is highly uniform and appears to be the result of a single introduction. Because it is known only from cultivation and no field-collected herbarium vouchers exist, there is the possibility that it is a cultivated plant of hybrid origin. However, because the taxon is clearly distinct, it will be retained here.

This species is distinguished by its persistent spathe, short, yet very tapered spadix, moderately long petioles and its leaf blades, rounded at the base, with several pairs of congested lateral veins near the base, and with a collective vein arising from near the base.

Anthurium martianum is closest in appearance to *A. dombeyanum*, which has generally shorter petioles and more undulate leaf blades that are broadest above the middle.

A living collection at the Munich Botanical Garden (without number) labeled *A. martianum* and vouchered as *Croat 61178* perhaps represents this species; however, although it closely matches the plate in Gartenflora 20: t. 681 (1871), it is smaller and the primary lateral veins are fewer and not nearly as distinct as the type material.

SURINAM?. Cultivated. Engler's Araceae Exsiccatae #165 (B, GH, P). Cultivated at Munich, *Croat 61178* (MO).

Anthurium napaeum Engl., Bot. Jahrb. Syst. 25: 407. 1898. TYPE: Ecuador. Pichincha: Río Napac ("Napa"), *Sodiro s.n.* (holotype, B). Figures 197, 199, 200.

Anthurium peripense Engl., Bot. Jahrb. Syst. 25: 442. 1898. TYPE: Ecuador. Manabí: Río Peripa, *Sodiro s.n.* (holotype, B).

Anthurium rircayanum Sodiro, Anal. Univ. Centr. (Quito) 22(156): 21. 1906. TYPE: Ecuador. Guayas: Río Rircay, *Rimbach s.n.* (holotype, B).

Terrestrial, or caespitose on rocks, sometimes epiphytic; stems 9–30 cm long, 1.5–2.5 cm diam.; roots numerous, dense, spreading to descending, white to green, whitish or brown on drying, ± smooth, thick and short to slender and elongate, weakly tapered at apex, 2–4 mm diam.; cataphylls subcoriaceous, 8–9(16) cm long, acuminate and apiculate at apex, pale green, drying tan, persisting intact, eventually as a reticulum of fibers. *Leaves* erect to erect-spreading; petioles (8)16–42 cm long, 5–15 mm diam., broadly triangular, convex adaxially with weak medial ridge, the margins prominently and sharply raised, almost winged, bluntly to sharply angular abaxially, the surface conspicuously pale short-lineate; geniculum slightly thicker and paler than petiole, 1–2 cm long; blades moderately coriaceous, broadly lanceolate to oblong-elliptic to oblanceolate, long-acuminate at apex (the acumen short-apiculate), acute to obtuse at base, (31)40–70(82) cm long, (5)9–28 cm wide, broadest at or above the middle, the margins flat to broadly undulate; upper surface glossy, dark green, lower surface glossy to semiglossy, conspicuously paler; both surfaces matte when dried, green to brown; midrib prominently convex at base, becoming higher than broad toward the apex above, pale short-lineate and paler than surface, prominently and sharply acute-raised below, raised above and below when dried, paler than surface below, same as surface above; primary lateral veins numerous, ca. 20–30 per side, departing midrib at 50–75° angle, straight-ascending, weakly visible above and below when fresh, slightly raised on both surfaces when dried; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins weakly visible when dried; collective vein arising from near the base or in the upper third of the blade, slightly more prominent than primary lateral veins when fresh below, equally as prominent as primary lateral veins when dried, 2–13 mm from margin. *Inflorescences* erect to spreading, shorter than leaves; peduncle 23–50(62) cm long, 3–7 mm diam., sharply 2–3-ridged, 2–3 × as long as petiole, green heavily tinged with red-violet at base, faintly red-violet toward the apex; spathe reflexed-spreading, subcoriaceous, green tinged with red-violet (B & K yellow-green 6/7.5), linear-lanceolate to lanceolate, 6–10 cm long, 0.4–1.5 cm wide, broadest near the base or in lower third, inserted at 60–70° angle on peduncle, long-acuminate at apex (the acumen inrolled), acute at base, the margins meeting at 90° angle; spadix brownish purple (B & K red-purple 2/10) to dark purple, rarely dark olive-green, cylindroid to weakly tapered, sessile or stipitate 1–2 mm, erect, 5.5–16 cm long, 5–6 mm diam. midway; flowers ± square to 4-lobed, 1.9–2.5 mm long, 2–2.4 mm wide, the sides jaggedly sigmoid; 4–6 flowers visible in principal spiral, 8–10 in alternate spiral; tepals matte to semiglossy, densely papillate; lateral tepals 0.7–1.2 mm wide, the inner margins straight, the outer margins

2-sided, sometimes weakly 4-sided; pistils raised but not emergent, or held slightly above the tepals, green; stigma ellipsoid, 0.4 mm long, brushlike; stamens emerging shortly above the tepals, laterals emerging almost to the apex before alternates emerge; filaments fleshy, translucent or purplish, 0.5–0.8 mm long, 0.4–0.8 mm wide; anthers yellow to purplish, 0.3–0.6 mm long, 0.4–0.7 mm wide, inclined over the pistil; thecae oblong, drying ovoid, scarcely divaricate; pollen white to yellow-orange fading to tan. *Infructescence* with spathe persisting; spadix 8–22 cm long, 0.5–1.4 cm diam.; berries reddish to dark purplish violet, ovoid, exserted, acute at apex, drying 4.2–6 mm long, 2–2.5 mm diam.

A member of series *Multinervia*, *Anthurium napaeum* occurs in Ecuador on the western slopes of the Andes, at 200 to 1,400 (1,800) m in premontane wet and premontane moist forest, and in Nariño, Colombia. One specimen from Cotopaxi, between Latacunga and Quevedo at 800 to 950 m, was reported to occur in montane moist forest.

This species is characterized by its generally terrestrial habit, short, densely rooted stem, cataphylls that persist as a reticulum of fibers, broadly triangular, conspicuously pale-speckled petioles, leaf blades which are usually glossy on both surfaces when fresh, drying green and often conspicuously paler below, and by its cylindroid, brownish purple spadix with 4–6 flowers visible in the principal spiral.

Anthurium napaeum is most closely allied to *A. palenquense*, which differs in having leaf blades with the margins conspicuously concave toward the base.

The names *Anthurium peripense* and *A. rircayanum* are synonymized here for the first time. The type localities of these species, together with that of *A. napaeum* are in the coastal lowlands of western Ecuador, draining into the Gulf of Guayaquil. The differences between the type specimens are slight, the main one being leaf shape: the types of *A. napaeum* and of *A. rircayanum* closely resemble each other in this respect, while that of *A. peripense* has straighter blade margins which are somewhat concave toward the base.

An unusual collection (*Croat 55782*) exhibits stamens starting emergence at the apex of the spadix and progressing regularly to the base, with the laterals preceding the alternates by up to 18 spirals. Basipetal maturation of the stamens has not been observed in any other *Anthurium*.

COLOMBIA. NARIÑO: La Planada, Salazar Finca 7 km above Ricaurte, 1,750 m, 1°08′N, 77°58′W, *Gentry et al. 35197* (COL, MO). ECUADOR. CAÑAR: Azoques–El Triunfo, 1 km S of La Delicia, 2°27′S, 79°10′W, *Croat 50876* (AAU, B, CAS, K, CM, M, MO, RSA, US); Azogues–El Triunfo, 5 km W of La Delicia, 8 km SE of El Truncal, 600 m, 2°27′S, 79°15′W, *Croat 50904* (CM, MO). CARCHI: Peñas Blancas, 900 m, *Christenson 1535* (MO). CHIMBORAZO: Sibambe, 1,000–1,600 m, *Solís 5342* (F); Río Chanchán, 5 km N of Huigra, 1,667–2,167 m, *Camp 3428* (NY). COTOPAXI: Quevedo–Latacunga, 800–950 m, 0°55′S, 79°10′W, *Holm-Nielsen et al. 3021* (AAU); Río Pilaló, Quevado–Latacunga, Tenefuerste, 750–1,300 m, *Dodson & Gentry 11987, 12297, 12797* (MO, SEL); 3 km E of El Palmar, 800 m, *Dodson & Gentry 10267* (MO, SEL); 55.5 km from Quevedo, 23.5 km E of La Maná, 930–950 m, 0°53′S, 79°04′W, *Croat 57035* (CAS, BG, K, MBM, MEXU, MO, P, PMA); Quevedo–El Corazón, 1.9 km NW of El Corazón, 67.5 km SE of Quevedo, 1,225 m, 1°07′S, 79°06′W, *Croat 55829* (MO, QCA); Río Angamarca, Quevedo–El Corazón, Las Juntas, 200 m, *Harling & Anderson 19025* (MO, GB); Quevedo–El Corazón, 63.4 km SE of Quevedo, 6 Km NW of El Corazón, slopes near waterfall above river, 1,030 m, 1°7′S, 79°7′W, *Croat 55782* (AAU, F, M, MO, NY, QCA, RSA, US). ESMERALDAS: 300 m, *Cobb 77* (MO). GUAYAS: Naranjal, Entable, below 500 m, *Lehmann s.n.* (K); Río Rircay, *Rimbach s.n.* (B). Junction of Provinces GUAYAS, CAÑAR, CHIMBORAZO & BOLÍVAR: Bucay, 420 m, *Camp 3648* (NY, MO). MANABÍ: Río Peripa, *Sodiro s.n.* (B). PICHINCHA: Quito-Santo Domingo de Los Colorados, Chiriboga Road, Estación Los Faisanes, 12 km from Río Pilatón, 1,400 m, *Harling & Andersson 23128* (GB); Río Pilatón, Alluruquín, 22 km E of Santo Domingo, 950 m, 0°15′S, 78°58′W, *Hammel & Wilder 16073* (B, K, MO); Km 23 on Santa Domingo-Puerto Limón road, 100 m, 0°21′S, 79°22′W, *Kvist 40676* (AAU); San Juan, La Palma, 930 m, *Croat 38739* (F, MO); Alluruquín-Chiriboga, 1,100 m, *Madison 4069* (K, SEL); Río Blanco, below confluence with Río Toachi, 300 m, *Harling 4516* (S); Río Napa, *Sodiro s.n.* (B).

Anthurium narinoense Croat, sp. nov. TYPE: Colombia. Nariño: Junín-Barbacoas road, 2–10 km N of Junín, 900–1,000 m, 1°30′N, 78°10′W, *Gentry et al. 55343* (holotype, MO 3486084; isotype, PSO). Figure 201.

Planta epiphytica; petiolus 12 cm longus, 7 mm diam., D-formatus; lamina oblongo-oblanceolata, basi attenuata, ad 93 cm longa, 16 cm lata; pedunculus ad 40 cm longus; spatha oblongo-lanceolata, ad 11 cm longa, 1.5 cm lata; spadix atrorubens, 17 cm longus, 5–6 mm diam.; baccae ignotae.

Description based on dried material only. Epiphytic; stem and cataphylls unknown. *Leaves* erect-spreading; petioles ca. 12 cm long, 7 mm diam., D-shaped, slightly convex adaxially, apparently rounded abaxially; geniculum 1.5 cm long; blades subcoriaceous, oblong-oblanceolate, acuminate at apex, long-attenuate at base, 93 cm long, 16 cm wide, broadest above middle, yellowish, the margins flat; midrib convexly raised above, prominently convexly raised below; primary lateral veins ca. 30

per side, departing midrib at 60–70° angle, slightly arcuate to the collective vein, slightly raised above and below; interprimary veins numerous, almost as conspicuous as primary lateral veins; tertiary veins scarcely raised above and below, more prominent below; collective vein arising from near the base, nearly as conspicuous as primary lateral veins, 5–9 mm from margin. *Inflorescences* erect-spreading; peduncle 40 cm long, ca. 5 mm diam., ca. 4× as long as petioles, terete; spathe reflexed, subcoriaceous, green, oblong-lanceolate, at least 11 cm long, 1.5 cm wide, broadest near base, inserted at 45° angle on peduncle, apex not seen, the base acute; spadix dark reddish, slightly tapered, ± straight, 17 cm long, 4 mm diam. near base, 3 mm diam. near apex; flowers rhombic, 2.4–2.8 mm long, 1.6–2 mm wide, the sides smoothly sigmoid; 7–8 flowers visible in principal spiral, 5–6 in alternate spiral; tepals ± smooth; lateral tepals ca. 1 mm wide, the inner margins straight, the outer margins 2–4-sided; anthers 0.2 mm long, 0.3 mm wide; thecae slightly divaricate. *Infructescence* not seen.

A member of series *Multinervia*, *A. narinoense* is known only from the type collection made in Nariño (hence the name), Colombia, at 900 to 1,000 m in pluvial forest.

Anthurium narinoense is distinguished by its large leaves (for the series), which dry yellow-green, and its slender, tapered spadix. It is apparently not closely related to any other species, but somewhat resembles *A. fasciale* and *A. santiagoense* from the eastern slopes of the Andes in Ecuador, which both have a more stubby spadix with more flowers in the principal spiral.

Anthurium narinoense is unusual in being the only species of *Pachyneurium* known from pluvial forest.

COLOMBIA. NARIÑO: Junín-Barbacoas, 2–10 km N of Junín, 900–1,000 m, 1°30'N, 78°10'W, *Gentry et al. 55343* (MO, PSO).

Anthurium nervatum Croat, Monogr. Syst. Bot. Missouri Bot. Gard. 14: 141. 1986. TYPE: Panama. Veraguas: valley of Río Tercero Brazo, beyond Escuela Agrícola Alto Piedra, above Santa Fe, 500–700 m, *Croat 27329* (holotype, MO 2253314; isotypes, F, K, PMA, US). Figures 198, 202.

Epiphytic, occasionally terrestrial; stem 10–75 cm long, 2.5–6 cm diam.; leaf scars 1–1.5 cm high, 2–3.5 cm wide; roots few, descending, greenish, pubescent, moderately thick and short, slightly tapered, 3–7 mm diam.; cataphylls subcoriaceous, lanceolate, 16–35 cm long, rounded to emarginate at apex with subapical apiculum ca. 5 mm long, green, drying tan (B & K yellow-red 9/10), persisting semi-intact, eventually as a reticulum of fibers. *Leaves* erect to spreading; petioles 18–100 cm long, 7–14 mm diam., bluntly to sharply quadrangular to D-shaped or subterete, prominently to weakly sulcate or flattened adaxially, the margins flat or raised, rounded abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, becoming fissured transversely with age, 1.5–5 cm long; blades moderately to thickly coriaceous, triangular to ovate-triangular, ovate-elliptic, acute to acuminate at apex (the acumen weakly apiculate), subcordate to cordate at base, sometimes decurrent on petiole, 27–98 cm long, 14.5–46 cm wide, broadest in the lower fourth of the blade, the margins broadly undulate; anterior lobe 25.5–90 cm long, the posterior lobes 4–19 cm long, directed downward and sometimes inward or outward; sinus arcuate with blade decurrent on petiole, to spathulate; upper surface matte to semiglossy, dark green, lower surface semiglossy, slightly paler; midrib bluntly angular-raised, becoming acutely to obtusely raised, and then weakly sunken at apex above, prominently and convexly raised below, paler than surface above and below; basal veins 3–6 pairs, often free to base, 2nd and 5th sometimes coalesced 1.5–2 cm, convexly raised above and below (less so below); primary lateral veins 19–25 per side, departing midrib at 50–60° angle, straight or weakly arcuate to the collective vein, prominently to weakly convexly raised above (more so below), paler than surface; interprimary veins sometimes present; tertiary veins obscure to weakly visible above, flat and darker than surface below; collective vein arising from one of the lowermost primary lateral veins or 1st to 2nd basal vein, weakly sunken above, weakly raised and darker than surface below, 1–5 mm from margin. *Inflorescences* erect to spreading; peduncle 10–35 cm long, 8–10 mm diam., 0.2–0.7× as long as petiole, green, terete; spathe reflexed, sometimes recurled, coriaceous to subcoriaceous, green to green heavily tinged with purple-violet to purplish or maroon, lanceolate to lanceolate-elliptic, 10–33 cm long, 2.5–5.5 cm wide, broadest just above the base, inserted at 30° angle on peduncle, long-acuminate at apex (the acumen inrolled), rounded to cordate at base; spadix green to purple to maroon, slightly tapered, (6)18–28 cm long, 1–2 cm diam. near base, 8–10 mm diam. near apex; flowers rhombic to weakly 4-lobed, 2.2–3.2 mm long, 2.0–3.1 mm wide, the sides weakly to jaggedly sigmoid; 10–15 flowers visible in principal spiral, 8–20 in alternate spiral; tepals matte, conspicuously punctate, minutely papillate; lateral tepals 0.8–1.6 mm wide, the inner margins broadly convex to concave when dried, the outer margins straight; pistils not emergent except when dried, green tinged with violet-purple; stigma linear, slitlike, 0.5–1 mm long; stamens emerging from the base, lateral stamens followed by alternates in rapid succession, the laterals preceding the alternates by 5–8 spirals, the 3rd stamen preceding the 4th by 6–8 spirals, held over and obscuring pistil; filaments red-violet, 1.4–1.6 mm long; anthers yellow, 0.4–0.7 mm long, 0.5–0.9 mm wide; thecae narrowly oblong to ovoid-oblong, weakly or not at all divaricate; pollen orange fading to tan or white. *Infructescence* spreading to pendent; spadix to 50 cm long, to 5 cm diam.; berries orange, oblong-ellipsoid to oblong-ovoid, acute at apex, the tip relatively blunt, to 14 mm long, 3.5 mm diam.; mesocarp with linear to punctiform raphide cells; seeds 2 per berry, oblong-ellipsoid to ellipsoid, somewhat flattened, 4.5–5 mm long, 2.7–3.2 mm diam., 1–1.5 mm thick, with a thin appendage at apex only.

Anthurium nervatum is endemic to Panama in Bocas de Toro, Coclé, Chiriquí, and Veraguas provinces at (130)500 to 2,100 m in tropical wet, premontane rain, and lower montane wet forest life zones.

This species is recognized by its long, triangular, shallowly lobed to subcordate, moderately thick leaf blades with numerous primary lateral veins, its usually long-tapered, green to maroon spadix, and by its lanceolate, coriaceous spathe that is deep maroon on the inner surface, green heavily tinged with maroon on the outer surface and often forms a loose spiral at anthesis.

Anthurium nervatum is most easily confused with *A. ranchoanum*, but that species has a shorter spadix with an erect, green spathe and larger flowers which are fewer per spiral. It may also be confused with *A. colonicum*, but that species has early exserted, acute pistils and fewer primary lateral veins.

One collection from El Valle in Coclé Province (*Croat 37443*) is probably also this species, but has a smaller, more ovate-triangular, more coriaceous blade with the posterior lobes sharply turned upward, and a deeper sinus; it also has a green rather than maroon spadix.

PANAMA. BOCAS DEL TORO & CHIRIQUÍ: Cerro Colorado, *Folsom et al. 4706* (MO); trail into Bocas and in woods on Pacific slope, from Chamí station to ca. 9 mi. along road, 1,100–1,750 m, 8°35′N, 81°54′W, *Hammel & Trainer 14919* (MO, PMA). CHIRIQUÍ: above Santa Fe along mining road 18–27 mi., off Pan-Am Hwy. above Chamí or turnoff to Escopeta, 1,200–1,500 m, *Croat 33145* (DUKE, F, MO, PMA); along mining road 31.6 km beyond bridge over Río San Félix, 10.6 km beyond turnoff to Escopeta, 1,690 m, *Croat 37177* (MO), *37169* (MO, PMA); upper mining road 20–28 mi. from San Félix, Continental Divide, 1,200–1,500 m, *Croat 33305* (MO), *33394* (MO, RSA, US); along mining road 20 mi. above bridge over Río San Félix, near village of San Félix, 750 m, *Croat 48459* (MO); Cerro Pate Macho, 1,500–1,900 m, *Stein et al. 1257* (MO); SE slopes, trail from Río Palo Alto, 4 km NE of Boquete, 1,700–2,100 m, *Sytsma et al. 4830* (MO). COCLÉ: Cerro Caracoral, *Duke & Dwyer 15118* (NY), *Kirkbride 1096* (MO, NY); Cerro Moreno, Molejón-Coclecito, 13 km NW of Cascajal, 130–250 m, 8°46′44″N, 8°31′54″W, *Davidse & Hamilton 23713* (B, MO); El Copé Region, Alto Calvario, 800–900 m, *Folsom & Jaslon 2691* (MO); El Copé, W of sawmill, *Hammel 2408* (MO); Continental Divide, lumber road N of El Copé, 10 km above El Copé, 2.2 km N of sawmill, 750–930 m, *Croat 44717, 49169* (MO, PMA); El Valle Region, El Valle de Antón, La Mesa, *Croat 37443* (CAS, CM, F, LE, KYO, M, MO, PMA, US). VERAGUAS: Santa Fe Region, vic. Escuela Agrícola Alto Piedra, 500–735 m, *Croat 33987* (CAS, MO, US), *34244* (MO, PMA), *Croat & Folsom 34134* (MO); 1,150–1,450 m, *McPherson 12070* (MO); Cerro Tute, 750–1,450 m, *Croat 48912, 48925* (MO, PMA), *Knapp & Dressler 5415* (MO, US), *5446* (MO), *Knapp & Kress 4369* (MO), *Knapp & Sytsma 2475* (MO), *Sytsma et al. 4590* (MO); Río Tercero Brazo, beyond school 500–700 m, *Croat 27329* (F, K, MO, PMA, US).

Anthurium nizandense Matuda, Bol. Soc. Bot. Mexico 24: 35, fig. 1. 1959. TYPE: Mexico. Oaxaca: Nizanda near the Isthmus of Tehuantepec, 16°40′N, 95°02′W, *MacDougall s.n.* (holotype, MEXU). Figures 207, 208.

Anthurium kruseanum Matuda, Anales Inst. Biol. Univ. Nac. Mexico 36: 107, fig. 1. 1966. TYPE: Mexico. Guerrero: La Junta (at junction of Río Omitlán and Río Papagayo) S of Tierra Colorada, *Kruse 881* (holotype, MEXU).

Usually terrestrial or epilithic; leaf scars 0.7–1.2 cm high, 1.3 cm wide; roots moderately numerous, descending, greenish to tan, smooth to somewhat pubescent, moderately elongate, tapered; cataphylls subcoriaceous, 3–7 cm long, rounded and minutely apiculate at apex, drying dark brown, persisting semi-intact, eventually as a reticulum of fibers. *Leaves* erect-spreading; petioles 6–24 cm long, (3)5–6 mm diam., quadrangular to D-shaped to subterete, flattened to broadly and sharply sulcate adaxially, the margins sharply raised, rounded abaxially, the surface pale-speckled, sometimes tinged with red-violet; geniculum slightly paler and thicker than petiole, 1–1.5 cm long; blades subcoriaceous, obovate-elliptic to elliptic, acute to abruptly acuminate at apex (the acumen apiculate), rounded to acute or attenuate at base, 25–57 cm long, 10.7–30 cm wide, broadest at or above the middle, the margins weakly undulate; upper surface matte to semiglossy, medium green, lower surface matte, paler below; both surfaces with short, linear raphide cells and convexly raised epidermal cells, drying brown to greenish brown; midrib acutely to convexly raised above, more prominently so below; primary lateral veins 6–11 per side, departing midrib at 50–80° angle, straight to weakly arcuate-ascending to the collective vein, raised above and below, darker than surface below; tertiary veins obscure above, weakly visible below; collective vein arising from about the middle of the blade or near the apex, 3–9 mm from margin. *Inflorescences* erect, equalling or longer than leaves; peduncle 31–60 cm long, 5–8 mm diam., 1.8–2.7 × as long as petiole, terete; spathe reflexed, subcoriaceous, green, ovate-lanceolate, 8–9.5 cm long, 2.5–3 cm wide, broadest near the base, inserted at 45° angle on peduncle, acute at apex, apparently obtuse at base; spadix pale green becoming reddish brown, somewhat tapered, 12–14 cm long, 9–11 mm diam. near base, 4 mm diam. near apex; flowers rhombic, 1.8–2.5 mm long, 2.8–3 mm wide, the sides sigmoid; 7–9 flowers visible in principal spiral, 5–6 in alternate spiral; lateral tepals 1.5 mm wide, the inner margins broadly convex or weakly concave; pistils not emergent; stigma broadly ellipsoid; stamens emerging rapidly in a complete sequence, emerging shortly above the tepals, arranged in a circle around the pistil; anthers ca. 0.4 mm long, 0.6 mm wide; thecae ellipsoid, weakly divaricate. *Infructescence* pendent; spathe withered; spadix 6.5 cm long, 1.5 cm diam.; berries greenish white, ovoid, 8 mm long; mesocarp transparent, juicy, pulpy; seeds 1(2) per berry, pale yellow (B & K yellow 9/2.5), broadly obovoid, 5.2–5.4 mm long, 4.5–4.7 mm diam., 3.4–4 mm thick, with a minute, translucent appendage, ± gnarled at apex on side, tinged with brown, enveloped by gelatinous substance.

Anthurium nizandense is endemic to Mexico in southern Guerrero and southern Oaxaca, where it occurs at less than 850 m in seasonally very dry habitats on steep, rocky cliffs in "selva baja caducifolia." It is known only from the vicinity of Tierra Colorada in Guerrero and Nizanda in Oaxaca.

This species is recognized by its greenish white berries and thick, narrowly to broadly elliptic or oblanceolate-elliptic, relatively long-petiolate leaves that are matte on the lower surface and sometimes exhibit a dense array of minute, linear raphide cells on drying. The epidermal cells on both surfaces of the blade are convexly raised. Matuda reported the petiole to be subquadrangular, but this was possibly due to a misinterpretation of the dried specimen since this feature is not apparent on live material.

In the area of Mexico where it occurs, *A. nizandense* could be confused only with *A. schlechtendalii* subsp. *jimenezii*, which occurs in similar habitats and is more generally abundant. *Anthurium nizandense* is distinguished by its proportionally longer petioles and its more typically elliptic blade, which is distinctly matte on the lower surface. In *A. nizandense* the blades are 1.3–2.5 times longer than the petioles. In *A. schlechtendalii* subsp. *jimenezii*, the leaf blades are usually semiglossy beneath and usually 6–10 times longer (rarely as little as 3 times longer) than the petiole.

MEXICO. GUERRERO: Río Omitlán, bridge over Río Omitlán at confluence of Río Papagayo with Río Omitlán, 850 m, *Croat 45756* (B, BM, CM, K, M, MBM, MO, P, TEX, US); La Junta, S of Tierra Colorada, *Kruse 881* (MEXU); Tierra Colorada, *Kruse 1595* (MEXU). OAXACA: Nizanda, Isthmus of Tehuantepec, *MacDougall s.n.* (MEXU).

Anthurium obscurinervium Croat, sp. nov. TYPE: Ecuador. Cañar: along road between Azogues and El Triunfo, ca. 2 km S of Hwy. at Cedro Pampa, 800–1,000 m, 2°25′S, 79°10′W, *Croat 50914* (holotype, MO 2828745; isotypes, AAU, BM, G, K, LL, M, MICH, NY, QCA, RSA, SEL, US). Figures 203, 204.

Planta terrestris aut epiphytica; caulis ad 30 cm longis, 1.3–3.5 cm diam.; cataphyllum persistens in fibris tenuibus; petiolus (3.5)6–22 cm longus, 4–10 mm diam., acute D-formatus; lamina anguste oblongato-elliptica aut oblonga-linearis, (18)30–79 cm longa, (3.2)4–7(11) cm lata; nervis primariis lateralibus obscuribus; pedunculus 20–45 longus; spatha (2.5)3–7 cm longa, 0.7–1.7 cm diam.; spadix viridis, (1.7)4–11(15) cm longus, 3–6 mm diam.; baccae atropurpurae.

Epiphytic or terrestrial; stem to more than 30 cm long, 1–3.5 cm diam.; roots dense, short, ca. 3 mm diam.; cataphylls subcoriaceous, 4–9 cm long, acute to acuminate at apex, drying whitish (B & K yellow 9/2.5 to yellow-red 9/7.5), persisting as linear fibers. *Leaves* spreading; petioles (3.5)6–22 cm long, 4–10 mm diam., sharply D-shaped, slightly thicker than broad, sharply flattened to broadly and shallowly sulcate adaxially, the margins sharply raised to curved inward, rounded to obtusely or acutely angular, sometimes 1-ribbed abaxially; geniculum somewhat thicker and much paler to darker than petiole, 0.7–1.7 cm long; blades subcoriaceous, narrowly oblong-elliptic to oblong-linear, long-acuminate to short-acuminate (rarely acute) at apex, attenuate to narrowly acute at base, (18)30–79 cm long, (3.2)4–7(11) cm wide, broadest at or near the middle, the margins flat, weakly revolute; upper surface semiglossy, medium to dark green, lower surface glossy, much paler; midrib convexly raised at base, becoming acutely raised toward the apex above, prominently and acutely raised at base, becoming less pronounced toward the apex below; primary lateral veins 25–55 per side, departing midrib at 40–50° angle, straight to the collective vein, obscure and flat above and below; interprimary veins numerous, almost as conspicuous as primary lateral veins; tertiary veins drying visible; collective vein arising from the base, slightly more prominent than primary lateral veins, 4–6 mm from margin. *Inflorescences* erect-spreading; peduncle 20–45 cm long, 2–4 mm diam., 1.6–4(5.5)× as long as petiole, pale green, sometimes tinged purplish, subterete to 3–4-ribbed; spathe spreading, rarely reflexed, thin, green to pale green, sometimes tinged with purple at margins, lanceolate-elliptic to linear-lanceolate, (2.5)3–7 cm long, 0.7–1.7 cm wide, broadest near the base, short-acuminate at apex (the acumen somewhat inrolled), acute at base; stipe 2–13 mm long in front and in back; spadix medium green (B & K yellow-green 7/5) to pale green, cylindroid, scarcely tapered, curved, (1.7)4–11(15) cm long, 3–6 mm diam. near base, 2–3 mm diam. near apex; flowers 4-lobed; 2–3 mm in both directions, the sides jaggedly sigmoid, 3–5 flowers visible in principal spiral, 5–7 in alternate spiral; tepals matte, weakly and minutely papillate, droplets present at anthesis; lateral tepals 1–1.8 mm wide, the inner margins straight to broadly rounded, the outer margins irregularly 3–5-sided; pistils weakly raised, green; stigma depressed, 0.2–0.4 mm long; stamens emerging in prompt sequence from the base, the laterals preceding the alternates by 3–11 spirals, held in a tight cluster above the pistil; filaments translucent, 0.4 mm long, 0.5–0.7 mm wide; anthers creamy white, 0.6–0.7 mm long, 0.7–0.9 mm wide; thecae ellipsoid to ovoid, scarcely divaricate; pollen pale yellow fading to white. *Infructescence* erect to pendent; spathe persisting, green, or absent; spadix 7–16 cm long; berries green becoming purplish to purple-black, obovoid-ellipsoid, quadrangular at apex, 6 mm long, 5 mm diam.

A member of series *Multinervia*, *Anthurium obscurinervium* is endemic to the Pacific slope of Ecuador, at 50 to 1,330 (2,000) m, in premontane moist, premontane dry and premontane wet forest.

This species is characterized by its more or less oblong leaf blades with the primary lateral veins obscure when fresh and obscure to weakly raised on drying (hence the name), green spadix with exserted stamens, and orange berries.

Anthurium obscurinervium is most similar to *A. carchiense*, which differs in having a brownish spadix and purple to purple-black fruits.

ECUADOR. BOLÍVAR: Charquiyacu, 600 m, *Solís 6114* (F). CAÑAR: Azogues–El Triunfo, 2 km S of Hwy. at Cedro Pampa, 800–1,000 m, 2°25′S, 79°10′W, *Croat 50914* (AAU, BM, G, K, LL, M, MICH, MO, NY, QCA, RSA, SEL, US). CARCHÍ: Gualpí Chico, near Awá encampment, 1,300 m, 0°58′N, 78°16′W, *Hoover et al. 2658* (MO). COTOPAXI: Río Pilaló, Quevedo–Latacunga, 950–1,100 m, 0°53′S, 79°10′W, *Holm-Nielsen et al. 3076* (AAU). EL ORO: 11 km W of Piñas, new rd. to Santa Rosa, 850 m, *Dodson et al. 9033, 9037* (MO, SEL); Machala–Loja, 25 km SE of jct. to Piñas, 890 m, 4°15′S, 79°45′W, *Croat 50715* (CM, MO, NY, SEL, US, TEX). GUAYAS: Naranjal–Machala, 13 km S of Naranjal, 50–150 m, *Harling & Andersson 19301* (GB, MO). LOS RÍOS: Alta Centinela, 29.5 km W of Patricia Pilar, 450–475 m, 0°33′S, 79°22′W, *Croat 50664* (AAU, MO, NY, RSA); Patricia Pilar–24 de Mayo, Centinela, *Dodson et al. 8703* (MO, SEL); Río Blanco, Santo Domingo de Los Colorados–Esmeraldas, Villa Hermosa, 3 km S of Km 24, 250 m, 0°5′S, 79°15′W, *Croat 50694A* (MO). PICHINCHA: 27 km S of San Juan, 12 km NE of Chiriboga, 2,000 m, 0°17′S, 78°42′W, *Croat 50606A* (IBE, K, MO, NY, RSA, US, VDB).

Anthurium oerstedianum Schott, Oesterr. Bot. Z. 8: 180. 1858. TYPE: Costa Rica. Near Naranjo, *Oersted s.n.* (lectotype, illustrated by Schott, Aroideae 328). Figures 205, 206.

Anthurium cuspidifolium Schott, Oesterr. Bot. Z. 8: 180. 1858. TYPE: Costa Rica, *Oersted s.n.* (lectotype, illustrated by Schott, Aroideae 314).

Terrestrial; stem to 30 cm long, 2–4 cm diam.; leaf scars, 0.8–1 cm high, 2–2.5 cm wide; roots moderately numerous, descending, tan, smooth, short, moderately thick, slightly tapered, 3–5 mm diam.; cataphylls subcoriaceous, 7–13 cm long, acute at apex and with subapical apiculum, medium green, drying brown, persisting intact, eventually deciduous. *Leaves* erect to spreading; petioles (12)30–73 cm long, 5–7 mm diam., quadrangular to subterete, flattened to weakly and broadly sulcate adaxially, sharply to bluntly 1–3 ribbed abaxially, the surface minutely pale-speckled; geniculum remote from the base of the blade 10–20 cm, 1.5–2 cm long; blades subcoriaceous, ovate to narrowly ovate or lanceolate, long-acuminate at apex, abruptly attenuate then acute to obtuse to truncate or subcordate at base, 20–66 cm long, 8.5–30 cm wide, broadest at or near the middle, the margins undulate; upper surface matte to weakly glossy, medium green, lower surface semiglossy to glossy, paler; midrib bluntly angular-raised above, below prominently higher than broad at base, becoming angular-raised toward the apex and paler than surface; primary lateral veins 11–20 per side, departing midrib at 40–60° angle, broadly arcuate, sunken to weakly raised in grooves above, prominently convexly raised below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins sunken above, raised below; collective vein arising from near the base, sunken above, raised below, equally as prominent as primary lateral veins, 2–8 mm from margin. *Inflorescences* erect, longer than leaves; peduncle (30)70–130 cm long, equal to 1.2–1.5 × as long as petiole; spathe pale green, ovate-lanceolate, 8–13 cm long, 2.5–4.8 cm wide, inserted at 45° angle on peduncle, acuminate at apex, rounded at base; spadix pale green, moderately tapered, 5–12 cm long, ca. 9 mm diam. near base, ca. 6 mm diam. near apex; flowers sub-rhombic to 4-lobed, 1.7–2.5 mm long, 2–2.7 mm wide, the sides straight to sigmoid; 8–9 flowers visible in principal spiral, 12–18 in alternate spiral; tepals matte, minutely and densely papillate; lateral tepals 1.4–1.8 mm wide, the inner margins straight; pistils weakly emergent, green; stigma 0.4 mm long, weakly exserted and brushlike, droplets appearing 3–4 days before stamens emerge; stamens emerging in a scattered pattern, held against the pistil; filaments fleshy, greenish, translucent; anthers creamy white, 0.5–1 mm long, 0.6–1.1 mm wide; thecae ellipsoid, not divaricate; pollen yellow fading to creamy white, abundant.

Anthurium oerstedianum is endemic to Costa Rica at 800 to 1,300 m, principally on the southwestern, Pacific slope in premontane wet, tropical wet, and premontane rain forest.

This species is distinguished by its strictly terrestrial habit as an understory forest herb and by its geniculum, which is located 10–20 cm below the base of the blade. Other distinguishing features are its four-sided petiole and greenish spadix. This species is a somewhat atypical member of sect. *Pachyneurium* because of its elongate petioles, remote geniculum, and lack of a dense, rosulate habit. It is apparently not closely related to any other species.

Anthurium cuspidifolium, which is synonymous with *A. oerstedianum*, was reported by Macbride (1936) from Peru. However, the specimens cited by him (*Macbride 5622* (F); *Schunke 572* (F)) are referable to *A. flavescens* Poeppig.

The Cartago collection locality cited by Schott in the type description is dubious because no modern collection of this species has been made from anywhere on the Atlantic slope. Since Schott mentions only "Naranjo," perhaps the collection refers to the Río Naranjo on the Pacific slope where it easily could have occurred.

COSTA RICA. CARTAGO: vic. Naranjo, *Oersted s.n.* (illustrated by Schott, Aroideae 328). PUNTARENAS: 6 km S of San Vito de Java, Wilson's finca, 1,330 m, *Raven 20922* (MO); Las Cruces Botanical Garden, along road to river below botanical garden, 1,300 m, *Croat 44415* (MO); Osa Peninsula, Corcovado, *Gilbert s.n.* (MO). SAN JOSÉ: San Isidro de General–coastal town of Dominical, SW of San Isidro, 900–1,000 m, *Croat 35267* (MO, NY), *35293* (MO); 0.5 mi. above turnoff to Canaán at Rivas, 900 m, *Croat 43419* (MO); El General, 1,010 m, *Skutch 2291* (MO); Cerro Pelón, N base, just E of main road, 0.5 km S of San Martín de Puriscal, 800 m, 9°44′N, 84°23′W, *Grayum & Baker 4693* (B, CR, MO); Río Chirripó del Pacifico, Canaán–Chimirol, General Valley, 1,000 m, *Burger & Liesner 7124* (MO).

Anthurium ottonis K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem XI: 609. 1932. TYPE: Bolivia. La Paz: Prov. Sud Yungas: Jirupaysi, near Yanacachi, *Buchtien 387* (holotype, B). Figures 209, 210.

Terrestrial; stem moderately slender, to at least 11 cm long, 0.8–1.5 cm diam.; roots moderately numerous, spreading, green, drying grayish to pale brown, ± villous, especially when young, elongate, somewhat tapered, sometimes branching, ca. 3–25 cm long, 2–8 mm diam.; cataphylls subcoriaceous, lanceolate to broadly lanceolate, 7–13 cm long, acute to rounded at apex, yellow-green, tinged with red, drying brown to reddish brown (B & K yellow-red 4/10), persisting intact to semi-intact, rarely as fine linear fibers, eventually deciduous. *Leaves* erect to spreading; petioles 22–42 cm long, 3–6 mm diam., erect to erect-spreading, subterete to broader than thick, bluntly and shallowly sulcate adaxially, rounded abaxially, the surface prominently pale-speckled; geniculum much paler and somewhat thicker than petiole, becoming fissured transversely with age, 0.5–2 cm long; blades coriaceous, linear-oblong, narrowly acute and mucronate at apex, acute to obtuse to narrowly rounded at base, 38–60(100) cm long, 2.2–7 cm wide, broadest at or near the middle (12.6–17.6 × longer than the petiole), the margins flat to somewhat undulate; upper surface matte to weakly glossy, dark green, lower surface matte, conspicuously paler; both surfaces drying matte, green to yellowish green; midrib convexly raised, paler than surface above, pale-speckled like petiole, higher than broad at base, becoming prominently convex toward the apex below, moderately paler than surface and pale-speckled like petiole; primary lateral veins 18–26 per side, departing midrib at 45–60° angle, straight to arcuate, weakly sunken to obscure above, darker than surface below; interprimary veins obscure above, almost as conspicuous as primary lateral veins below; tertiary veins obscure above, weakly visible below; reticulate veins not visible; collective vein arising from the base, equally as prominent as primary lateral veins, 1–4(6) mm from margin. *Inflorescences* erect, shorter than leaves; peduncle 27–50 cm long, 2–4 mm diam., 0.8–1.3 × as long as petioles, pale reddish, drying greenish to brownish, terete; spathe spreading-recurled, subcoriaceous, yellow-green tinged with red on the midline, oblong-lanceolate to linear, ca. 3.5–6.5 cm long, 0.8–1.3 cm wide, broadest near the base, acute to abruptly acuminate at apex (the acumen apiculate, 4 mm long), acute at base; spadix maroon (B & K red-purple 2/5), dark brown when dried, slightly tapered, subsessile, somewhat curved, held at 150° angle from peduncle, 4–10(12) cm long, 4–5(6) mm diam. near base, 2–3 mm diam. near apex; flowers ± square to almost 4-lobed, 2–2.4 mm in both directions, the sides ± straight to jaggedly sigmoid; 3–6 flowers visible in principal spiral, 6–9 in alternate spiral; tepals matte, very minutely and densely papillate, punctate, with few droplets appearing as stamens emerge; lateral tepals 1–1.2(2) mm wide, the inner margins straight to convex, the outer margins 2- rarely 3-sided; pistils semiglossy, minutely papillate, emergent before stamens emerge, dark maroon; stigma ellipsoid, 0.3–0.7(0.9) mm long, depressed medially; stamens emerging in a regular sequence from the base, arranged shortly above the tepals, the laterals preceding the alternates by 14–15 spirals, held in a circle around the pistil; anthers white, drying white to brown, 0.5–0.7 mm long, 0.6–1 mm wide; thecae ovoid, not divaricate; pollen white. *Infructescence* not seen.

A member of series *Multinervia*, *Anthurium ottonis* is known from Bolivia in the Department of La Paz and in Puno, Peru, at 890 to 1,700 (2,500) m in lower montane subtropical moist, lower montane subtropical wet, and subtropical moist forest life zones.

This species is distinguished by its erect-spreading leaves, long, pale-speckled, subterete petioles and narrowly straplike blades, and long-pedunculate inflorescence with a moderately stubby, maroon spadix. It is not confused with any other *Pachyneurium* species and apparently has no close relatives. Although on the majority of dried specimens the anthers appear orange to brown, the type specimen displays white-drying anthers.

A collection (*Bogner 903*) cultivated at the Munich Botanical Garden and represented by two sheets at the Kew Herbarium is similar to *A. ottonis* in most respects, except that it has a prolonged, free-ending sheath 4–11.7 cm long. It may represent a new species.

BOLIVIA. LA PAZ: Prov. Inquivisi, Inquivisi–Circuata, 2,500 m, *Besse et al. 656* (SEL); Prov. Loayza, Circuata–Miquilla, Km 28, 1,560 m, *Besse et al. 1839* (SEL); Prov. Nor Yungas, Coroico, Polo-Polo, 1,100 m, *Buchtien 3659, 3661* (US), *3660* (GH, US), *3662* (HBG, US); Coroico (Yolosa jct.)–Caranavi, road parallel to Río Coroico, 670–1,280 m, *Davidson 4790* (MO); Río Huarinilla, 4.5 km below Yolosa, then 14 km W on road up Río Huarinilla, 1,200–1,300 m, 16°12′S, 67°50′W, *Solomon 9390* (MO); below Yolosa, 1,450 m, *Solomon 8652* (B, MO); Prov. Sud Yungas, 15 km toward Irupana, Chulumani, 1,700 m, *Beck 4724* (K, M, MO); Yanacachi, Jirupaysi, 1,650 m, *Buchtien 387* (B); Chulumani, 50 km towards Asunta, 890 m, *Beck 12606* (MO); 26 km towards Asunta, past Tajama, 1,300 m, *Beck 12074* (MO). PERU. CUZCO: Urubamba, Machupicchu, 2,000 m, *Bogner 903* (K). PUNO: San Gavón, *Baker 4358* (cultivated at MO) (MO, NY).

Anthurium oxycarpum Poeppig in Poeppig & Endl., Nov. Gen. Sp. 3: 83. 1845. TYPE: Peru. Loreto: Yurimaguas, *Poeppig s.n.* (lectotype, selected here, G). Figures 211–213.

Anthurium strictum N. E. Br ex Engl., Monogr. Phan. 2: 638. 1879. TYPE: Brazil. Acre: Rio Branco, *N. E. Brown s.n.* (K, identified with Kew Negative #2805).

Epiphytic or terrestrial, sometimes epipetric; stem short or elongate, to 60 cm long, 1–3 cm wide; leaf scars inconspicuous, obscured by root mass, 1 cm high, 1.2 cm wide; roots numerous, dense, spreading, green to whitish, smooth to densely pubescent when dried, short, bluntly tapered, 1–7.5 cm long, (1)2–4 mm diam.; cataphylls membranous to subcoriaceous, lanceolate, prominently 1-ribbed throughout, 5.5–12 cm long, acuminate at apex with subapical apiculum 1–2 mm long, light green, drying thin, yellowish to pale tan (B & K yellow 7/5), persisting ± intact, eventually as fine linear fibers. *Leaves* erect to erect-spreading; petioles (2.5)5–15 cm long, 4–9 mm diam., subterete to C-shaped to D-shaped, flattened to narrowly or obtusely sulcate adaxially, the margins blunt, rounded abaxially, the surface dark green, pale-speckled; geniculum slightly thicker than petiole, 1–2.5 cm long; sheath for 3–4 cm long; blades subcoriaceous, narrowly to broadly elliptic to broadly oblanceolate to narrowly obovate, acute to short-acuminate at apex (the acumen downturned, inrolled), obtuse to acute or attenuate at base, (12)22–55 cm long, 10–19 cm wide, broadest at or above the middle, the margins flat to broadly undulate; upper surface glossy to semiglossy, occasionally matte, medium to dark green, lower surface matte to weakly glossy, moderately to conspicuously paler; midrib above raised and paler than to concolorous with the surface, below prominently and obtusely to acutely raised at base, becoming convexly raised toward the apex and slightly paler than surface; primary lateral veins 10–25 per side, departing midrib at 40–70° angle, straight to weakly arcuate to the collective vein, weakly raised near the midrib, becoming sunken in grooves toward the margin; interprimary veins weakly sunken above, weakly raised below; tertiary veins weakly sunken above, raised below; reticulate veins obscure; collective vein arising from near the base, sunken above, raised below, paler than surface, 5–11 mm from margin. *Inflorescences* erect, equaling or longer than leaves; peduncle 18.5–54.7 cm long, 3–5 mm diam., 2.5–5× as long as petiole, green, terete; spathe spreading to reflexed at an acute to almost right angle from spadix, coriaceous to subcoriaceous, light to dark green, sometimes tinged with red or maroon at margins, lanceolate to ovate-lanceolate, sometimes elliptic, 4.5–12.5 cm long, 1–3 cm wide, broadest usually in the lower third (sometimes at or near the middle), inserted at 35–45° angle on peduncle, abruptly acuminate at apex (the acumen tightly inrolled, 6 mm long), acute to acuminate at base, the margins meeting at 60–80° angle; stipe to 17–20 mm long in front, 0–1 mm long in back; spadix bluish green to green to yellow-green, also reported as creamy and tan, tapered, erect, held at 140–170° angle from peduncle, 4–8.5 cm long, 6–10 mm diam. near base, 3–7 mm diam. near apex; flowers square, 2.4–3.2 mm in both directions, the sides moderately straight parallel to spiral, straight to jaggedly sigmoid perpendicular to spiral; 4–7 flowers visible in principal spiral, 9–11 in alternate spiral; tepals covered with thin, matte, bluish green, waxy bloom, few droplets present at anthesis; lateral tepals 1.3–2 mm wide, the inner margins broadly convex, the outer margins 2–3-sided; pistils weakly emergent at anthesis, matte covered with waxy bloom, green, becoming brown; stigma oblong-ellipsoid, 0.6–0.7 mm long, brushlike and depressed medially before droplets emerge; stamens emerging in a prompt, regular, complete sequence from the base, inclined slightly inward over the stigma; anthers creamy white to orange, 0.5–0.6 mm long, 0.6–0.8 mm wide; thecae oblong-ovoid, scarcely divaricate; pollen white. *Infructescence* with spathe persisting; spadix 6.5–8.5 cm long, 1.8–2.5 cm diam., with berries scattered throughout; berries green, becoming red and eventually purple in the apical half, obovoid-oblong to ellipsoid-obovoid, long-acuminate toward the apex, rounded at apex with radial ridges, 7.5–12.3 mm long, 4.2–5 mm diam near base, toward the apex narrowing to 1.7–2.5 mm diam.; pericarp thin, transparent; mesocarp gelatinous with moderate number of raphide cells; seeds 2 per berry, yellowish, oblong-ovoid, flattened, 5.3–5.5 mm long, 3 mm diam., 1.5–1.8 mm thick, enveloped by transparent, sometimes amber, gelatinous, sticky substance.

Anthurium oxycarpum ranges from southeastern Colombia to Amazonian Ecuador, Peru, Bolivia, and Brazil at 100 to 870 (1,300) m. It occurs in tropical moist, premontane wet and tropical wet forest life zones.

This species is distinguished by its rosulate habit, generally short, densely short-rooted stem, conspicuously veiny leaves (with at least some of the tertiary veins sunken above), and especially by its erect, narrowly ovate-lanceolate spathe and frequently bluish green, slightly tapered spadix. The leaf blades characteristically dry thin and somewhat glossy on the lower surface. Some cultivated plants of this species have markedly bullate and weakly quilted leaf blades, a characteristic not yet observed in the field.

Anthurium oxycarpum is closest to *A. knappiae*, which differs in having petioles two to three times longer, an attenuate leaf base, a much longer peduncle, a nonglaucous spadix, and tepals with conspicuous raphide cells. See discussion of that species for details.

The original type specimen designated by Poeppig was collected in Brazil at Ega (now Tefe), located on the Rio Solimoes at the mouth of the Rio Japurá. Originally deposited at Vienna, this specimen is now lost, and a thorough search of all major herbaria has turned up no duplicates. Consequently, a second Poeppig collection from Yurimaguas in Peru, cited by Engler in his 1905 revision, is here designated as the lectotype. The Yurimaguas collection is also the only one illustrated by Schott (Scott drawing 356; NYBG Negative #3873; microfiche #15: C-7).

Considerable confusion exists regarding the type of *Anthurium strictum*, now a synonym of *A. oxycarpum*. In preparing a description of what he presumed to be *A. dombeyanum* for the Refugium Botanicum, Baker (1871) described and illustrated instead *A. oxycarpum*. Upon realizing this error and assuming the latter to be a new species, Engler (1879) redescribed it as *A. strictum*, attributing the name to N. E. Brown at Kew. He cited as the type the same material used to illustrate the Refugium Botanicum article, namely a specimen from the Rio Branco in Brazil (at least an inflorescence of the type specimen had been sent to Engler in Berlin by N. E. Brown).

Engler also misidentified as *Anthurium strictum* an Ule collection (*5598*) from western Acre along the Rio Jurua Mirim. While photographing type specimens in Berlin, J. F. Macbride of the Field Museum incorporated into a single photograph an inflorescence of *A. oxycarpum* (labeled *A. strictum*) with the Ule collection misidentified by Engler. The latter collection, which is complete, is actually *A. uleanum*. The mixed collection represented in this Field Museum photograph needs to be corrected. The specimen to the left represents *A. uleanum*, while the one to the right (inflorescence only) represents *A. oxycarpum*.

BOLIVIA. EL BENI: Rurrenabaque, *Cárdenas 1167* (NY); Prov. Ballivian, Misión Fátima Río Maniqui, *Canchi & Hinojosa 1045* (LPB, MO). LA PAZ: Prov. Larecaja, 27.8 km N of Caranavi, *Croat 51651* (MO); Prov. Sud Yugas, Alto Beni Concesión de la Cooperación de San José de Popoy, 600 m, *Seidel & Schulte 2246* (LPB, MO). BRAZIL. ACRE: Abuña–Rio Branco, *Forero et al. 6315* (COL, NY, US, INPA); Rio Branco, Zoobotanical Garden of Federal University of Acre, *Lowrie et al. 170* (INPA, MG, MO, NY); Mpo. Caramari Amazonas, Rio Juruá, N of Cruzeiro do Sul, Lago da Cigana (São Luis), S of Porto Alvaro Nestrinho, 150 m, 7°37′S, 72°36′W, *Croat 62498A* (CM, INPA, MO); Rio Juruá Mirim, *Ule 5598* (B). AMAZONAS: Rio Javarí, behind Estirão de Equador, *Lleras et al. P17284* (INPA, NY); Rio Purus, Monte Verde, *Huber 4623* (MG). RONDÔNIA: NW of Rio Madeira, across from Matuparana, *Calderón et al. 2828* (MO, NY, US); Mpo. Ariquemes, Mineracão Mibrasa, sector Alto Candeias, Km 128, 10°35′S, 63°35′W, *Teixeira et al. 467* (NY, INPA). COLOMBIA. Without locality, *Fantz 4032* (FTG). AMAZONAS: Leticia, *Krukoff 5144* (NY), *Oldenburg 2812* (US); Río Loretoyacu, 100 m, *Schultes & Black 8407* (US, GH); Puerto Nariño, 100 m, *Plowman 3221* (GH, US, SEL), *Madison 3743* (cult. plant of *Plowman 3221* (SEL). ECUADOR. MORONA-SANTIAGO: 20 km from Limón, 700–900 m, *Harling & Andersson 12875* (GB). NAPO: Reserva de Producción Faunística Cuyabeno, N of Laguna Grande, 265 m, *Nielsen 76226, 76516* (AAU), *Poulsen 79692* (AAU); Puerto Napo–Puerto Misahuallí, 3.5 km E of Puerto Napo, 1°2′S, 77°47′W, *Croat 58882* (C, CAS, CM, GH, MO, NY, QCA, RSA, SEL); 8 km below Puerto Misahuallí on Río Napo, 1.5 km S, 1°4′S, 77°36′W, 450 m, *Palacios et al. 404* (MO, QCNE), *Palacios 2859, 2877* (MO), *2961* (MBM, MO, QCNE, W); Lago Agrio–Coca, 8.8 km S of Río Aguarico on road to Coca, San Francisco de Orellana, *Croat 58512A* (MO); confluence of Río Borja and Río Quijos, E bank, ca. 1,300 m, 0°25′S, 77°49′W, *Holm-Nielsen et al. 26234* (AAU); Río Aguarico, *Holm-Nielsen et al. 21115* (AAU, UEC); 30 min. by canoe below San Pablo, 250 m, 0°18′S, 76°25′W, *Laegaard 51563* (QCA); Río Arajuno, Sola Cocha, 500 m, 1°7′S, 77°36′W, *Palacios et al. 896* (MO); Río Lagartococha, 190 m, 0°33′S, 75°13′W, *Lawesson et al. 44409* (AAU); Río Napo, Limoncocha, 240 m, *Foster 3839* (F), *Madison et al. 5432* (MO, SEL, QCA, US, K); Jatún Sacha Biological Reserve, 8 km below Misahuallí, 450 m, 1°04′S, 77°36′W, *Cerón 723, 1312* (MO), *Cerón et al. 1992* (MO, QCNE); 400 m, *Cerón 6289* (MO, QCA), *5963* (KRAM, MO, OOM); Río Wai si aya, 1 km upstream from Río Aguarico, *Brandbyge et al. 33190* (AAU); NAPO–PASTAZA: Tena, *Asplund 9199* (S); Tena–Napo, *Asplund 10253* (S). PASTAZA: Río Curaray, Curaray, 200 m, *Harling & Andersson 17517* (GB). PERU. AMAZONAS: Prov. Bagua, Río Cenepa, Pagat, *Kayap 422* (DUKE, MO). AYACUCHO: Río Apurimac, Kimpitiriki, 400 m, *Killip & Smith 23021* (US). HUÁNUCO: Tingo María Region, Prov. Leoncio Prado, 5 km S of Tingo María, Route 16, 870 m, *Davidson 3424* (MO, LAM); E of Tingo María, *Barbour 20476* (US); Las Palmas–Tingo María, 720 m, *Madison 6743* (QCA, SEL); Puente Durán, *Plowman & Kennedy 5699* (SEL, MO); Río Monzón, *Schunke 5111* (GH, F, US, NY); Jacintillo, W of Tingo María, 800 m, *Plowman & Kennedy 5772* (F, GH); Quebrada Las Pavas, 5 km N of Tingo María, 720 m, *Plowman & Kennedy 5708* (GH); W of Tingo María, Cerro Quemado, 700–800 m, *Schunke 10438* (AAU, BM, MO, NY, RSA, U, US), *10602* (MO); Dtto. Ruppa Ruppa, Carpar Bella, Cave of Los Huarinos, 700–900 m, *Schunke 9465* (CAS, CM, F, G, MO); Río Huallaga, 750–800 m, *Plowman & Ramirez 7569* (F); Tingo María–Monzón, Río Patay Rondos, 650 m, 9°21′S, 76°12′W, *Croat 57946* (CM, MO). JUNÍN: Puerto Bermúdez, 375 m, *Killip & Smith 26604* (US, NY); Oserato Tambo, *Weiss 152* (F); Río Leco, *Soukup 3516* (F); Río Perene, mouth of river, *Weberbauer 11920* (USM). LORETO: Iquitos, road to Quisto Cocha, 100 m, *Plowman 2585* (F, GH); Prov. Alto Amazonas, Andoas, 180 m, 02°55′S, 76°25′W, *Vásquez & Jaramillo 4566* (MO); Río Huallaga, Santa Rosa, below Yurimaguas, 135 m, *Killip & Smith 28714* (NY, US); Yurimaguas, 135 m, *Killip & Smith 28014* (NY, US, F); Yurimaguas–Balsapuerto, 135–150 m, *Killip & Smith 28367* (US); Río Huallaga (lower basin), Balsapuerto, 150–350 m, *Killip & Smith 28628* (US, NY); Río Napo, Entrada de Isla Inayuga, *Croat 20549* (MO); Prov. Coronel Portillo, Caserío de J. C. Mariategui and Mejico, 300 m, 8°15′S, 73°45′W, *Diaz et al. 756* (MO); Prov. Maynas, Iquitos Region, Soledad, Río Itaya, 110 m, *Killip & Smith 29762* (NY, US); Río Amazonas, Explorama Inn, 1 km S of Indiana, 130 m, 3°30′S, 73°01′W, *Croat 61679* (AMAZ, MO), *Gentry et al. 54623* (MO), *55986* (MO), *61772* (MO), *65765* (MO, TEX), *65805* (MO, SAR); 106 m, *Vásquez et al. 12152* (MO); Indiana–mouth of Río Napo, 130 m, 3°28′S, 72°48′W, *Gentry et al. 31429* (MO); Iquitos Region, Las Pebas, Río Ampiyacu, Pijuayal Army Base, 3°10′S, 71°49′W, *Plowman et al. 7131* (F, GH); Indiana–mouth of Río Napo, Yanamono, 130 m, 3°28′S, 72°50′W, *Croat 61739* (AMAZ, MO), *Gentry et al. 27509, 39713, 42256* (MO), *Gentry & Jaramillo 28062* (MO), *Gentry & Vásquez 42296* (MO); Dtto. Mazán, Río Amazonas–Mazán, 100–150 m, *Rimachi 212* (IBE, MO); Veradera de Mazán, *Croat 19428* (F, MO, USM), *20779, 20789* (MO); Prov. Requena, Sinchicuy, 106 m, 3°35′S, 73°15′W, *Vásquez et al. 7830* (MO). MADRE DE DIOS: Prov. Manú, Manú National Park, Cocha Cashu Biological Station, 350–400 m, *Foster 9902* (B, K, MO), *Gentry 2720* (MO), *43638*

(MO, SEL), *Nuñez 5537* (MO), *5738* (MO, W), *5809* (MO, US); Río La Torre, confluence of Río Tambopata and Río La Torre, 39 km SW of Puerto Maldonado, 12°50′S, 69°20′W, *Barbour 4767*, *5424* (MO), *Smith et al. 132* (MO, US), *346* (US), *1387*, *1391* (US). PASCO: Prov. Oxapampa. Palcazú Valley, Iscozazin, 380 m, 10°12′S, 75°15′W, *Foster et al. 7841* (MO); Río San José, Río Chuchurras drainage, 400–500 m, 10°09′S, 75°20′W, *Smith 4037* (MO). UCAYALI: LSU base camp, Quebrada Shesha (trib. of Río Abajao), 65 km NE of Pucallpa, 250 m, 8°02′S, 73°55′W, *Gentry & Díaz 58559* (MO).

Anthurium oxyphyllum Sodiro, Anales Univ. Centr. Ecuador 15(108): 5. 1901. TYPE: Ecuador. Pichincha: near Santo Domingo de Los Colorados, 400 m, *Sodiro s.n.* (holotype, Q). Figures 214–216.

Epiphytic; stem short, (1)1.5–2 cm diam.; roots dense, numerous, ascending to spreading, green, smooth when young, soon becoming tomentose, slender and elongate, to 13 cm long, 2–6 mm diam.; cataphylls membranous, 7–10 cm long, narrowly rounded at apex with subapical apiculum ca. 8 mm long, drying tan (B & K yellow 9/2.5), persisting as fine linear fibers. *Leaves* spreading; petioles 6–25(30) cm long, 4–7 mm diam., D-shaped, flattened to convex to weakly sulcate or occasionally with a medial rib adaxially, the margins sharply raised, rounded abaxially; geniculum thicker and paler than petiole, (0.7)1–2 cm long; blades coriaceous, narrowly elliptic to sometimes narrowly oblanceolate, long-acuminate at apex (the acumen flat), long-attenuate at base, 45–70 cm long, (4)6–11 cm wide, broadest at or near the middle, the margins broadly undulate; upper surface matte, dark to bright green, lower surface glossy to semiglossy, paler; both surfaces drying matte, greenish to yellowish brown; midrib flat to convexly raised above, prominently and acutely raised and paler than surface below; primary lateral veins 25–35 per side, departing midrib at 30–60° angle, ± straight to the collective vein, scarcely raised to flat or weakly sunken above, weakly raised to ± obscure below, drying slightly raised above and below; interprimary veins numerous, almost as conspicuous as primary lateral veins, obscure when fresh, weakly raised when dried; tertiary veins visible when dried; collective vein arising from near the base, equally as prominent as primary lateral veins, raised when dried, 3–6 mm from margin. *Inflorescences* pendent to erect-spreading, shorter than leaves; peduncle (21)24–46 cm long, (3)4–5 mm diam., 1.2–6 × as long as petiole, light green tinged with purple or maroon at least at base, terete to subterete and flattened adaxially; spathe deflexed to reflexed, held at 130–160° angle to peduncle, often weakly twisted, subcoriaceous, green to green tinged with purple or red (B & K yellow-green 7/10), lanceolate to oblanceolate, (5)7.2–10.5 cm long, (1.8)2.3–3 cm wide, broadest near the base, inserted at 30–90° angle on peduncle, abruptly acuminate at apex (the acumen inrolled), obtuse to rounded at base, the margins meeting at 100–140° angle; stipe 3–7 mm long or absent; spadix green to yellow-green (B & K yellow-green 6/10), cylindroid, semi-erect to nodding, usually slightly curved, held at (150)130–60° angle from peduncle, 5.8–11 cm long, 3–7 mm diam. near base, 3–5 mm diam. near apex; flowers ± rhombic to 4-lobed, 3–4.5 mm long, 3.7–4.3 mm wide, the sides straight to smoothly or sometimes jaggedly sigmoid; 5–7 flowers visible in principal spiral, 6–8 in alternate spiral; tepals brown, matte to semiglossy, minutely papillate, with abundant droplets present; lateral tepals 1.3–2.5 mm wide, the inner margins broadly convex to straight, scarcely turned up against the pistil, the outer margins 2-sided; pistils prominently emergent, exserted and papillate, the exposed portion squarish, green becoming dark purple; stigma linear to ellipsoid, ca. 0.4 mm long, weakly raised, copious droplets appearing before the stamens emerge; stamens emerging in a regular sequence throughout, held well above the tepals, lateral stamens emerging almost to apex before alternates begin to emerge, arranged in a circle around the pistil; filaments transparent, prominently exserted, thin and flattened, 1.5–1.7 mm long; anthers orange, becoming pinkish or reddish brown, ca. 0.8 mm long, 0.9 mm wide; thecae oblong-ellipsoid, scarcely divaricate; pollen orange, fading to white or tan. *Infructescence* with spathe persisting; spadix 9.5–11.5 cm long, 1–1.5 cm diam., with berries scattered throughout; berries orange, ellipsoid, acute and with radial ridges at apex, 6.8–7 mm long, 3.2–3.7 mm diam.; mesocarp mealy; seeds 1 per berry, yellow-brown when dried, ± ovoid, truncate at both ends, 3.5–5 mm long, 2.2–3 mm diam., 1.5–1.6 mm thick, enveloped by gelatinous, translucent, amber substance.

A member of series *Multinervia*, *Anthurium oxyphyllum* is endemic to the Pacific slope in Ecuador from Carchí to Cotopaxi at 300 to 1,300 m. This species is ecologically variable, with specimens collected both in a lower montane dry forest life zone (Esmeraldas) and a montane rainforest life zone (Carchí). Despite occurring in different life zones, the specimens themselves do not differ significantly in any aspect. However, the type collection is somewhat unusual in having leaf blades with apices cuspidate-acuminate rather than long-acuminate.

This species is characterized by its epiphytic habit, generally oblong-elliptic, coriaceous, greenish-drying blades with numerous primary lateral and interprimary veins, long peduncles (1.2–6× longer than the petioles) and flowers with prominently exserted stamens. However, the best distinguishing character is the nodding inflorescence with the spathe and spadix abruptly bent downward at the base.

Anthurium oxyphyllum bears some resemblance to *A. carchiense* and *A. obscurinervium*, both of which have less coriaceous leaf blades and erect inflorescences.

Sodiro (1902) asserts that the leaf blades are not punctate, but rather "pellucid-punctate under a lens." This agrees with living material, in which the leaf blades cast a semi-"velvety" sheen when held at arm's length. This effect results from modified epidermal cells ("pellucid punctations") which scatter light in different directions. Most of Sodiro's descriptions were based on living material, and this observation was probably made on a living plant.

ECUADOR. CARCHÍ: Chical, 1,130 m, 0°56′N, 78°14′W, *Hoover & Wormley 1402* (MO); Río San Juan, Chical, 12 km below Maldonado, 1,200 m, 1°4′N, 78°17′W, *Madison et al. 4507* (K, SEL, F); Peñas Blancas, 20 km below Maldonado, 1,100 m, *Madison 6967* (SEL); Gualpi Chico, Forestry Reserve, vic. of encampment at Awá Ethnic, 1,330 m, *Hoover et al. 3256* (MO). COTOPAXI: Quevedo–Latacunga, 55.5 km from Quevedo, 23.5 km E of La Maná, 930–950 m, 0°53′S, 79°4′W, *Croat 57056* (CM, MO). ESMERALDAS: less than 300 m, *Cobb 72* (MO); Ibarra–San Lorenzo, Lita, 550–650 m, *Madison et al. 4992* (SEL, K, QCA), *5141, 5199* (SEL), *Croat 69736* (cultivated at MO); Lita, 600–650 m, *Maas & Cobb 4743* (U, QCA). IMBABURA: vic. Lita, 600 m, *Cobb 35* (MO); Río Mira, Ibarra–Lita, 2.5 km E of Lita, 750–775 m, *Croat 38977* (M, MO, RSA, SEL).

Anthurium pachylaminum Croat, sp. nov. TYPE: Peru. San Martín, Moyobamba–Chachapoyas, Km 430–431, E of Naranjos at Río Naranjos, 770 m, 5°21′S, 77°20′W, *Croat 58161* (holotype, MO 3148985; isotypes AAU, B, CAS, F, GH, K, M, NY, P, SEL, U, US, USM). Figures 217–220.

Planta epiphytica; petiolus sulcatus, 8–20(32) cm longus; lamina elliptica aut late elliptica vel oblanceolata, 40–112 cm longa, (11)17–43 cm lata, acuminata, basi acutata et interdum decurrenti, in pagina inferior pustulata vel aliquando glandulosa; nervii primarii laterales 6–9 utroque; pedunculus 36–95 cm longus, 2–9 plo longior quam petiolus; spatha subcoriacea, linearis-lanceolata, 10–23 cm longa, 1–2.5 cm lata; spadix atrorubens vel atroviolaco-atropurpurea, cylindricus, 11–39 cm longus; cum fructu pendulus; baccae ferentes ad basim.

Epiphytic, sometimes terrestrial; stem to 8 cm long, 1.5–6 cm diam.; roots numerous, dense, spreading, the uppermost ascending, gray when dried, drying short-pubescent, 2–10 cm long, 2–5 mm diam.; cataphylls coriaceous to subcoriaceous, broadly lanceolate, 5–7 cm long, acute at apex, drying reddish brown (B & K yellow-red 04/05), persisting semi-intact at the upper nodes. *Leaves* erect-spreading; petioles 8–20(32) cm long, ca. 8 mm diam., D- to C-shaped, broadly to narrowly sulcate adaxially, with the margins blunt, rounded abaxially; geniculum 1–2 cm long; sheath to 6 cm long; blades coriaceous, elliptic to broadly elliptic or oblanceolate, acuminate at apex (the acumen to 2 cm long), occasionally obtuse at base, but mostly acute to decurrent, 40–112 cm long, (11)17–43 cm wide, broadest at or above the middle, the margins flat to broadly undulate; upper surface glossy, dark green, lower surface glossy to matte, paler, often sparsely to moderately pustulate or glandular; both surfaces drying yellowish green; midrib flat at base, becoming convexly raised toward the apex above, obtuse to acute-raised below; primary lateral veins 6–9 per side, departing midrib at 25–50° angle, mostly ascending, ± straight to the margin, sometimes loop-connecting in the uppermost portion of the blade, raised above and below; tertiary veins etched above, weakly raised below; collective vein arising from near the apex or absent, sunken above, raised below. *Inflorescences* erect; peduncle 36–95 cm long, 3–10 mm diam., 2–9× as long as petiole, olive-green, terete; spathe spreading-reflexed, recurled, subcoriaceous, green heavily tinged with maroon especially on the inner surface, with raphide cells, linear-lanceolate, 10–23 cm long, 1–2.5 cm wide, broadest near the base, acute at apex, decurrent at base; spadix dark red to dark violet-purple (B & K purple 2/7.5), sessile or stipitate to 10 mm, cylindroid to tapered, erect, 11–39 cm long, 6–7 mm diam. near base, 4 mm diam. near apex, broadest at the base or near the middle; flowers rhombic, ca. 2.4 mm long, ca. 1.4 mm wide, the sides straight; 7–9 flowers visible in principal spiral, 8–10 in alternate spiral; tepals matte, papillate; lateral tepals 1–1.4 mm wide, the inner margins ± straight to broadly convex, the outer margins 2–3-sided; pistils not emergent; stigma linear, 0.4–0.6 mm long, appearing granular; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by 28 spirals, the 3rd stamen preceding the 4th by 6 spirals, inclined over and obscuring pistil;

anthers 0.4–0.6 mm long, 0.6–0.8 mm wide; thecae ovoid, slightly divaricate; pollen pale orange. *Infructescence* pendulous; spathe withered or absent; spadix 22–53 cm long, 1.4–1.7 cm diam., mostly bearing berries in the basal portion only; stipe to 10 cm long; immature berries reported as brown.

Anthurium pachylaminum is known from Loreto, San Martín, and Pasco in Peru at (240)320 to 770 m. It may be epiphytic or terrestrial in sandy, inundated soils and on steep slopes in tropical moist and premontane wet forest life zones.

This species is distinguished by its unusually large, coriaceous leaf blades (hence the name), with the tertiary veins etched into the upper surface (when fresh) and the primary lateral veins departing the midrib at an acute angle and running more or less straight to the margin. The leaf blades of *A. pachylaminum* are often pustular or glandular on the lower surface, and the spathe does not wither at anthesis, but often persists and remains in a weathered condition on the fruiting spadix.

Anthurium pachylaminum bears a similarity in leaf shape and inflorescence shape and color to *A. atropurpureum* var. *arenicola*. The latter, however, has mostly eglandular lower leaf surfaces, and the spathe withers at anthesis. It also generally has smaller leaves and shorter peduncles (1–4 × as long as petiole) than *A. pachylaminum* (2–9 × as long as petiole).

PERU. LORETO: Prov. Alto Amazonas, Río Capihuari, 5 km NE of Andoas, near Ecuador border, 240 m, *Gentry & Díaz 28226* (MO, NY); Prov. Maynas, Río Tacshacuraray, *Croat 20389* (F, MO, USM). PASCO: Prov. Oxapampa, Iscozazin–Villa America, Palcazú Valley, 300 m, 10°12′S, 75°13′W, *Smith 3855* (MO); Río Iscozazin, Cabeza de Mono, 10 km SW of Iscozazin, Palcazú Valley, 320 m, 10°20′S, 75°18′W, *Gentry et al. 41949* (MO). SAN MARTÍN: Moyobamba–Chachapoyas, Km 430–431, E of Naranjos at Río Naranjos, 770 m, 5°21′S, 77°20′W, *Croat 58161* (AAU, B, BM, CAS, F, G, GH, K, M, MO, NY, P, QCA, RSA, SEL, U, US, USM); Río Huallaga, Tocache Nuevo–Juanjui, 65.5 km S of Juanjui, 16 km S of Río Pulcache, 700 m, 7°50′S, 76°40′W, *Croat 58076* (MO); 65.5 km N of Tocache Nuevo, 114.5 km S of Juanjui, 16 km S of Río Pulcache and village of San Martín, 700 m, 7°50′S, 76°40.5′W, *Croat 58063* (MO); 56 km W of Rioja, 2 km E of Naranjos, 770 m, 5°51′S, 77°40′W, *Knapp et al. 7451* (BM, MO); Prov. Mariscal Cáceres, Dtto. Tocache Nuevo, Fundo de Las Flores, 550–600 m, 8°10′S, 76°33′W, *Croat 50990* (K, MO); Quebrada de Canuto, 500 m, *Schunke 10945* (CM, MO); Quebrada de Ishichimi, Tocache, 400 m, *Schunke 10047* (MO); Río Tocache, Puente Palo Blanco, 10 km W of Tocache Nuevo on rd. to Puerto Pizana, 550–650 m, 8°14′S, 76°36′W, *Plowman et al. 11347* (F); Puente Palo Blanco, 500–550 m, 8°14′S, 76°36′W, *Plowman & Schunke 7432* (F).

Anthurium palenquense Croat, sp. nov. TYPE: Ecuador. Los Ríos: Río Palenque Science Center, along trails W of laboratory and in vicinity of laboratory clearing, 210–250 m, *Croat 38670* (holotype, MO 2395515; isotypes, AAU, B, K, NY, QCA, PMA, RSA, US). Figures 221, 223, 224.

Planta terrestris; internodia brevia, 1–1.2 cm diam.; petiolus (6)10–30 cm longus, 5–20 mm latus, triangularis; lamina elliptica ad lanceolata ad oblanceolata, basi attenuata; nervis primariis lateralibus (9)14–30 utroque; pedunculus 10–60 cm longus, 2–10 mm latus, quadrangularis vel 2–4-costatus; spatha angusti lanceolata ad oblonga-lanceolata, 3–12 cm longa, 0.5–2.5 cm lata, viridis; stipes liber ad 1–5 mm; spadix contractus, (2)4–12 cm longus, 6–9 mm latus prope basim, 3–4 mm latus prope apicem, flavo-virens; baccae ovoideae, purpureae, 5–11 mm longae, 5–6 mm latae.

Terrestrial; stem green turning brown, calloused, 15–30 cm long, 1–2.5 cm diam.; leaf scars obscured by root mass, 1 cm high, 1–1.5 cm wide; roots numerous, descending, grayish or green, smooth or scurfy, blunt, 1–20 cm long, 2–5 mm diam.; cataphylls membranous to subcoriaceous, lanceolate, 4.5–17 cm long, narrowly acute and apiculate at apex, green tinged reddish at margins, drying pale tan (B & K yellow 5/10), persisting semi-intact or as coarse linear fibers or as bundles of linear fibers, often with the apex remaining intact. *Leaves* erect to spreading; petioles (6)10–30 cm long, 5–20 mm diam., sharply triangular, flattened to broadly convex adaxially, the margins winged, sharply angular abaxially; geniculum scarcely thicker and slightly paler than petiole, the angular ribs often conspicuously and minutely undulate, 1–3 cm long; sheath 1–2 cm long; blades subcoriaceous to coriaceous, elliptic to lanceolate or oblanceolate, long-acuminate at apex (the acumen flat to slightly inrolled), attenuate with conspicuously concave margins at base, (16)30–64(70) cm long, (7.5)10–23 cm wide, broadest usually near or below the middle, the margins broadly undulate; upper surface matte, velvety, the cells convex, sunken, forming an alveolate pattern when dried, dark green (B & K green 4/2.5), lower surface matte, paler (B & K green 7/2.5); midrib flat to obtusely angular at base, becoming sharply acutely raised toward the apex above, acutely raised (knife-edged), and higher than broad below; primary lateral veins (9)14–30 per side, departing midrib at 40–65(80)° angle, ascending straight to the collective vein, weakly sunken to weakly raised above, darker than surface and weakly raised below; interprimary veins numerous, scarcely sunken, ± parallel to and less conspicuous than primary lateral veins; tertiary veins obscure above and below; collective vein arising from near the base, weakly sunken or weakly raised above, weakly raised or flat below, prominulous when dried, equally as prominent as primary lateral veins, 5–18 mm from margin. *Inflorescences* erect to slightly spreading or ± pendent, shorter than leaves; peduncle 10–60 cm long, 2–10 mm diam., 0.3–3× as long as petiole, green to dark purple or heavily tinged-mottled with red-purple (B & K red-purple 2/2.5), ± quadrangular or with 2–4 irregular ribs and convex sides; spathe spreading and weakly twisted or reflexed, membranous to subcoriaceous, green tinged maroon at margins and along main nerves (B & K red-purple 2/10), minutely pale-speckled (at least abaxially), narrowly lanceolate to oblong-lanceolate, 3–12 cm long, 0.5–2.5 cm wide, broadest near base, inserted at 30–90° angle on peduncle, acuminate at apex (the acumen inrolled, (2)5–15 mm long), acute to decurrent at base; stipe 3–15 mm long in front, 1–5 mm long in back; spadix yellow-green tinged with purple, becoming purple-violet or dark green tinged purplish at anthesis, cylindroid, sometimes weakly tapered, erect to curved, (2)4–12 cm long, 3–5 mm diam. near base, 3–4 mm diam. near apex; flowers with a faint, sweet, fruity scent, square to rhombic, 2–3.8 mm long, 1–3.8 mm wide, the sides straight to gradually sigmoid; 2–5 flowers visible in principal spiral, 2–6 in alternate spiral; tepals matte to semiglossy, minutely papillate and weakly punctate; lateral tepals 1.4–2.6 mm wide, the inner margins broadly convex, turned up against pistil, the outer margins 2-sided; pistils exserted 0.4–1.5 mm, glossy, green, sometimes tinged with purple around the stigma; stigma ellipsoid, greenish, 0.4–0.8 mm long, 0.25–0.4 mm wide, brushlike with blunt papillae, droplets appearing 1 week before stamens emerge; stamens emerging rapidly in a regular sequence from the base, the laterals preceding the alternates by 5–28 spirals (by ca. ¾ the length of the spadix), held erect above tepals and pistil; filaments translucent, exserted, 0.6–1 mm long, 0.4 mm wide; anthers orange (B & K yellow-red 7/10), 0.4–0.6 mm long, 0.5–0.7 mm wide, not obscuring pistil; thecae ellipsoid, 0.25 mm wide, weakly divaricate; pollen orange to yellow fading to cream-white (B & K yellow-red 7/2.5). *Infructescence* with spathe persisting; spadix 5–15 cm long, 0.5–1.5 cm diam.; berries dark purple, ovoid, acute at apex, 5–11 mm long, 5–6 mm diam.; pericarp thickened, with numerous raphide cells; seeds 1–2 per berry, with numerous raphide cells, rounded to ovoid, usually flattened on one side, 4–5.6 mm long, 3.2–3.8 mm diam., 1–2.8 mm thick, with a translucent gelatinous appendage at both ends.

A member of series *Multinervia*, *Anthurium palenquense* occurs in Ecuador in Esmeraldas, Cotopaxi, Los Ríos, and Pichincha provinces, at 80 to 400 m, typically in mature forest or in disturbed primary forest in tropical moist and premontane wet forest life zones. Most collections were made at the Río Palenque Biological Station in Los Ríos, hence the name.

Anthurium palenquense is distinguished by its terrestrial habit, coarse cataphyll fibers, triangular-winged petioles and closely veined, bicolorous blades which are attenuate at the base and matte to semivelvety on the upper surface. In addition, the long-exserted stamens and the brushlike stigma are characteristic. An unusual feature is the pale raphide cells speckling the petioles, spathe, tepals, and even the filaments, as well as the pericarp and seed coat. This species (erroneously reported as *A. buenaventurae* Engl.) is pollinated by *Eulaema bomboides* (Dodson & Gentry, 1978).

Two collections of *Anthurium palenquense* from Esmeraldas and Cotopaxi (*Asplund 16306* and *Sparre 17214*), do not display the brushlike stigma (typical of the species), but agree in other characters with the present overall concept of *A. palenquense*.

Anthurium palenquense is most closely related to *A. napaeum*, which differs in having the leaf blades mostly acute at the base with convex to more or less straight (rather than concave) margins.

ECUADOR. COTOPAXI: Quevedo–Latacunga, 44.7 km E of Quevedo, 400 m, 0°51'S, 79°12'W, *Croat 55862* (AAU, CAS, DUKE, GB, JBGP, MO, OOM, QCA, RSA, SAR, TEX, US); Río Guapara, 20 km NW El Corazón, 250 m, *Sparre 17214, 17465, 17466* (S). ESMERALDAS: Quinindé, Rosa Zarate, *Asplund 16306* (S); Río Esmeraldas, Río Mutil, 6.6 km beyond Univ. Techn. Luis Vargas Torres–Est. Exp. Mutile, 80 m, 0°52'N, 79°33'W, *Croat 55610* (MO, QCA, U). LOS RÍOS: Quevedo–Santo Domingo de Los Colorados, Río Palenque Biological Station, 150–250 m, 0°35'S, 79°25'W, *Croat 38670* (AAU, B, K, MO, NY, QCA, PMA, RSA, US), *38688* (AAU, MBM, MO, NY, QCA, RSA), *49739* (MO), *50659* (CM, MICH, MO, SAR), *Dodson 5173* (MO, QCA, SEL, US), *Dodson & Gentry 12830* (SEL), *Dodson & McMahon 5059* (MO, SEL, US), *Gentry & Dodson 41298* (MO), *Lojtnant & Molau 15766* (AAU), *Madison 3742* (cult. at SEL) (MO), *Schupp 83* (SEL), *Watson 267* (NY). PICHINCHA: Santo Domingo–Quinindé, 300 m, *Solís 13952* (F).

Anthurium pallatangense Engl., Bot. Jahrb. Syst. 25: 385. 1898. TYPE: Ecuador. Cotopaxi: vic. Angamarca, *Sodiro s.n.* (holotype, B). Figures 222, 225.

Anthurium rumicifolium Sodiro, Anales Univ. Centr. Ecuador 15: 5. 1901. TYPE: Ecuador. Cotopaxi: Angamarca, 3,000 m, *Sodiro s.n.* (holotype, B).
Anthurium albopunctatum Sodiro, Anales Univ. Centr. Ecuador 22 (156): 22. 1906. TYPE: Ecuador. Pichincha: Nanegal, *Sodiro s.n.* (holotype, B).

Terrestrial or epiphytic; stem ca. 30–50 cm long, 1.5–2 cm diam.; leaf scars obscured by root mass, 0.5 cm high, 1 cm wide; roots dense, descending, greenish, drying tan to grayish, smooth to somewhat pubescent, slender and elongate, tapered at apex, ca. 4–26 cm long, 1–4 mm diam.; cataphylls lanceolate, 4–11 cm long, acuminate at apex, drying reddish brown, persisting as pale, fine, linear fibers. *Leaves* spreading-erect; petioles 10–33 cm long, 3–8 mm diam., terete to subterete, sometimes obtusely flattened adaxially, rounded abaxially; geniculum obscurely flattened, scarcely darker than petiole, 0.6–2 cm long; blades subcoriaceous, narrowly to broadly elliptic, occasionally oblanceolate, gradually acuminate at apex, slightly attenuate to narrowly acute to obtuse to subtruncate at base, 20–56 cm long, 4–15 cm wide, broadest at or near the middle; upper surface matte to semiglossy, dark to medium green, lower surface glossy to semiglossy, much paler; both surfaces drying matte to semiglossy, bright green to yellowish; midrib round-raised at base, becoming very narrowly and sharply raised (knife-like) toward the apex above, prominently and convexly raised with a sharp rib below; primary lateral veins 12–35 per side, departing midrib at 45–55° angle, ± straight to the collective vein, prominently and sharply raised above, flat to raised below, very sharply raised above when dried; interprimary veins drying almost as conspicuous as primary lateral veins, sharply raised above; tertiary veins obscure, drying prominulous; collective vein arising from the base, scarcely visible above, flat below, less prominent than primary lateral veins when dried, 3–11 mm from margin. *Inflorescences* spreading-erect, shorter than leaves; peduncle 6.2–29(38) cm long, 2–6 mm diam., (0.9)1.9–2.7× as long as petiole, pale green, tinged with violet-purple, subterete to angulate; spathe spreading to reflexed and recurled, subcoriaceous, green to green tinged with purple at margins and on veins, oblong-lanceolate, 2.5–7 cm long, 7–10 mm wide, broadest near the base, inserted at 65° angle on peduncle, acute to shortly acuminate at apex (the acumen apiculate), acute at base; stipe 7–10 mm long in front, 3–6 mm long in back; spadix maroon to purple, becoming brown (B & K red-purple 2/7.5), cylindroid, sometimes slightly tapered at apex, 3–8 cm long, 3–6 mm diam. midway; flowers 4-lobed, 2.1–2.4 mm in both directions, the sides jaggedly sigmoid; 3–5 flowers visible in principal spiral, 6–8 in alternate spiral; tepals matte, weakly papillate, with droplets; lateral tepals 1–1.3 mm wide, the inner margins straight to convex, slightly turned up against the pistil, the outer margins irregularly 3–4-sided; pistils raised, green; stigma ellipsoid; stamens emerging in a scattered pattern from the base of the spadix; filaments transparent, thick, exserted, soon retracting, holding anthers at level of the tepals, ca. 0.3 mm long, 0.4 mm wide; anthers yellowish heavily tinged with maroon, 0.6 mm long, 0.9 mm wide, inclined over and obscuring the pistil; thecae oblong, not divaricate; pollen orange, fading to tan. *Infructescence* with spathe persisting; spadix 6 cm long, 1.3 cm diam.; berries purple, obovoid, truncate at base, rounded and somewhat mammilliform at apex, 6–6.8 mm long, 3.7–4.5 mm diam.; seeds 2 per berry, brownish, oblong, flattened, rounded at both ends, 3.2–3.5 mm long, 2.2–2.5 mm diam., 1.5–1.7 mm thick, enveloped by gelatinous, translucent, amber substance.

A member of series *Multinervia*, *Anthurium pallatangense* is endemic to Ecuador in Carchí, Pichincha, Cotopaxi, and Chimborazo provinces at (1,710) 2,000 to 3,000 m. It occurs in lower montane dry, premontane dry, and montane moist forest life zones.

This species is distinguished by its broadly elliptic leaf blades with the primary lateral veins drying sharply raised (knife-edge-like) and a collective vein arising more or less from the base. In these characteristics it is very similar to *A. penningtonii*, probably its closest ally. Were it not for their geographical separation (either side of the Andes), *A. penningtonii* might be relegated to subspecific or varietal status. *Anthurium penningtonii* differs, however, in its green spadix (sometimes tinged purple or brown), and occurs in wetter life zones as well.

ECUADOR. CARCHÍ: 7.8 mi. SE of Maldonado, rd. to Tulcán, 2,400 m, 0°53′N, 78°5′W, *Thompson & Rawlins 888* (CM); Maldonado–Tulcán, Km 205, 2,400–2,600 m, *Werling & Leth-Nissen 362* (QCA). CHIMBORAZO: Pallatanga, *Sodiro 24* (B). COTOPAXI: Angamarca, ca. 3,000 m, *Sodiro s.n.* (B). PICHINCHA: Aloág-Santo Domingo, San Ignacio, 2,000 m, *Sparre 14687, 17742* (S); Machachi–Santo Domingo, 40.8 km E of Alluriquín, 2,050 m, 0°26′ S, 78°40′W, *Thompson & Rawlins 1094* (CM); Tandayapa–Mindo, 15.1 km beyond Tandayapa, 2,400 m, *Croat 49374* (MO, QCA); Nono–Nanegal, NW of Quito, 11–12 km NW of Nono, 2,200–2,270 m, *Croat 38837* (MO); Nanegal, *Sodiro s.n.* (B); Mindo-Tandayapa, 10 km SW of Tandayapa, 2,200 m, 0°00′N, 78°32′40″W, *Croat & Rodríguez 61545* (MO); Chiriboga Road, Chiriboga–Santo Domingo de Los Colorados, El Volante, 1,900 m, *Asplund 17418* (S); Quito–Santo Domingo de Los Colorados, 19 km S of San Juan, 15 km NE of Chiriboga, 1,710 m, 0°17'S, 78°43'W, *Croat 50621* (MO); Río Alambi, Nono–Tandayapa, km 43–45, 2,000–2,500 m, *Sparre 17016* (S); Quito–Puerto Quito, 13 km NW of Nono, 2,225 m, *Luteyn & Lebrón-Luteyn 6523* (NY); Volcán Pichincha, W side, Tandayapa–Mindo, 2,300 m, 0°2'S, 78°42'W, *Croat 50256* (MO, RSA, USM).

Anthurium paraguayense Engl., Bot. Jahrb. Syst. 25: 361. 1898.

a. Anthurium paraguayense var. **paraguayense**. TYPE: Paraguay. Central: Asunción, Colonia Elisa, *Lindman A1823* (holotype, B; isotype, S). Figures 226, 227, 231.

Anthurium rodrigoi A. Hawkes, Phytologia 3: 27. 1948. TYPE: Argentina. Chaco: Tapenaga, Enrique Urien, *Rodrigo 2690* (holotype, NY).

Anthurium rusticum N. E. Br. ex Engl., Pflanzenr. IV. 23B(Heft 21): 82. 1905. TYPE: Bolivia. La Paz: Yungas, Coroico, *Bang 2479* (holotype, NY; isotypes, GH, MO).

Terrestrial or epiphytic; stem to 40 cm long, (1)5–6 cm diam.; roots numerous, dense, descending or ascending, green or tan, smooth to pubescent, blunt, longitudinally fissured when dried, 3–10 cm long, 2–5 mm diam.; cataphylls membranous to subcoriaceous, 3–9.5 cm long, acute and sharply 1-ribbed at apex (apiculate to 1 mm), pale green, drying dark brown to tan (B & K yellow 6/5), persisting as a reticulum of fibers at base. *Leaves* erect to spreading; petioles 3–28.5 cm long, 6–10 mm diam., D-shaped to sometimes nearly quadrangular, shallowly sulcate with a medial rib adaxially, the margins acutely raised, bluntly to sharply 1–3-ribbed abaxially, the surface green sometimes pale-speckled; geniculum thicker and paler than petiole, 0.7–2.5 cm long; sheath 0.9–2.5 cm long; blades subcoriaceous, oblanceolate to oblong-oblanceolate, long-acuminate at apex (the acumen inrolled to flat), acute to obtuse to rounded or truncate at base, 22–100 cm long, 5–19.5 cm wide, broadest above the middle, the margins prominently undulate; both surfaces semiglossy to matte, dark to medium green above, paler or concolorous below; both surfaces drying usually greenish; midrib broadly raised at base with an acute medial rib, diminishing and becoming sunken toward the apex above, slightly raised when dried, convexly raised at base, becoming acute and then narrowly raised toward the apex above, slightly raised when dried; primary lateral veins 4–10 per side, departing midrib at (25)30–70° angle, arcuate-ascending to the margin or loop-connecting to the primary lateral vein above it, raised above near the midrib, weakly sunken at the margin, raised below; interprimary veins obscure above, visible below; collective vein arising from near the apex, weakly sunken above, bluntly raised below, prominulous when dried, 5–9 mm from margin. *Inflorescences* erect or spreading, shorter than leaves; peduncle 14–65 cm long, 8–9 mm diam., ca. 2–6 × as long as petiole, dark green, terete to subterete; spathe spreading to reflexed with the margins rolled under, coriaceous, dark green tinged with purple (B & K yellow-green 4/7.5), lanceolate to ovate-lanceolate, (2)6–15 cm long, (0.7)1.7–3 cm wide, broadest in the lower third, inserted at 40–50° angle on peduncle, acute to acuminate at apex (the acumen inrolled), acute to decurrent at base, minutely verruculose on inner surface; spadix green tinged with purple or gray-brown (B & K yellow 5/7.5), tapered, (2.4)5–15 cm long, 4–15 mm diam. near base, ca. 3–8 mm diam. near apex; flowers 4-lobed to rhombic, (1.7)2.5–4 mm long, (2.2)2–4 mm wide, the sides jaggedly sigmoid; 5–8 flowers visible in principal spiral, 7–10 in alternate spiral; tepals matte, sometimes appearing punctate and papillate; lateral tepals 0.9–1.5 mm wide, the inner margins convex or straight, the outer margins smoothly 3–4-sided; pistils not emergent or scarcely emergent, green tinged with purple; stigma ellipsoid to slit-like, 0.2–0.5 mm long; stamens emerging in a regular sequence, emerging shortly above the tepals, the laterals preceding the alternates by 10–12(21) spirals, the 3rd stamen preceding the 4th by 3–4 spirals; filaments translucent, with raphides, 1–1.5 mm long; anthers yellowish to red-purple (B & K red-purple 7/5), 0.5–0.7 mm long, 0.8–0.9 mm wide, inclined over and obscuring the pistil; thecae oblong-obovoid to oblong-ellipsoid, slightly or not at all divaricate; pollen pale yellow to cream, scented like grass. *Infructescence* spreading-pendent; spathe persisting; spadix 17.5–20 cm long, to 3.5 cm diam.; berries reddish to maroon (B & K red-purple 2/7.5), obovoid, rounded at apex, 5–10 mm long, 3–6 mm diam.; pericarp moderately thickened, with raphide cells at base; mesocarp translucent to milky, thick-gelatinous; seeds 2 per berry, white, streaked with reddish or maroon, ovoid, flattened, 5–6.2 mm long, 2.5–3.4 mm diam., 1–2 mm thick, with a gelatinous appendage at both ends.

Anthurium paraguayense is a common terrestrial, occasionally epiphytic species of southern Brazil (Mato Grosso Sul), Bolivia, Paraguay, and northern Argentina. It is mostly reported from dry areas, on steep slopes and sandy or rocky soils at 150 to 1,700 m. In Bolivia it occurs in subtropical moist and lower montane subtropical wet forest life zones.

This species is distinguished by its long, narrow blade with undulate margins and by its petiole that is bluntly 1–3-ribbed abaxially and shallowly sulcate adaxially, with a prominent medial rib. Also characteristic is the peduncle, which is usually 2–6 times longer than the petiole, and its persistent, coriaceous spathe, which is verruculose on the inner surface, appearing to have minute grains of sand spread across it. Other diagnostic features include the presence of raphides in both vegetative and floral structures (including the blade, petiole, peduncle, spathe, filaments, tepals, berry, and seed coats).

Anthurium paraguayense var. *paraguayense* is similar to var. *coroicoanum*, with which it may occur, but has a proportionally longer peduncle compared to the petiole, and a persistent spathe that appears rather verruculose adaxially. Both taxa are represented by an unusually high proportion of fruiting specimens in herbaria. The var. *coroicoanum* is distinguished by its broadly elliptic leaf blades with reflexed basal primary lateral veins, while var. *paraguayense* has lanceolate to oblanceolate blades lacking any reflexed venation. The two taxa occur in similar habitats and elevations in close geographic proximity.

A noteworthy collection is *Beck 6996*, from the Department of Beni, Bolivia, which has the lowermost primary lateral veins spreading at a ca. 90° angle from the midrib, but otherwise demonstrates all the characteristics of the typical variety.

ARGENTINA. CHACO: Tapenanga, Enrique Urien, *Rodrigo 2690* (NY); General Vedia, *Meyer 2406* (GH). CORRIENTES: Dpt. San Ignacio, San Ignacio, *Schinini 20961* (K, MO); Dpt. San Luis del Palmar, 65 km SE of San Luis del Palmar, Ruta 5, *Schinini et al. 21647* (K). FORMOSA: *Jorgensen 2349* (MO), *2347* (GH, US); Dpto. Pilcomayo, Parque Nacional Pilcomayo, *Charpin & Eskuche AC 20316* (MO, US). BOLIVIA. WITHOUT LOCALITY: *Bang 1660* (F), *2581* (NY); *Rusby 2479* (F, NY, US). BENI: Prov. Ballivian, Río Yacuma, Espíritu, 200 m, *Beck 3296* (B, K, MO, TEX); Serranía de Pilón Lajas, 75 km from La Paz, San Borja, 950 m, *Beck 6996* (MO). LA PAZ: Canamina, 1,500 m, *Rusby 375* (NY); Prov. Larecaja, Caranavi–Guanay, 27.8 km N of Caranavi, 865 m, 15°33'S, 67°45'W, *Croat 51646A* (MO); Prov. Loayza, Chulumani–Circuata, Km 9, Miquilla, 1,530 m, *Besse et al. 1852* (SEL), *Christenson 1533* (MO); Prov. Morillo, Valle de Zongo, along trail from end of rd. at Kahua Power Plant, 1,660–1,690 m, *Croat 51406* (MO); Prov. Nor Yungas, Coroico, *Bang 2479* (GH, MO, NY); Coroico, Polo-Polo, 1,100 m, *Buchtien 3654*, *4516* (US); Millaguaya, 1,300 m, *Buchtien 4284* (NY, US); Chuspipata–Yolosa, 20 km NE of Chuspipata, 10.2 km SW of Yolosa, 1,700 m, 16°12'S, 67°47'W, *Solomon & Uehling 12252* (MO); Unduavi–Caranavi, 82.6 km NE of Unduavi, 1,300 m, *Croat 51559* (MO); Río Huarinilla, 4.5 km below Yolosa, then 10 km W on rd. up Río Huarinilla, 1,450 m, 16°12'S, 67°50'W, *Solomon 8560* (MO); Prov. Sud Yungas, 22 km toward new bridge on Río La Paz, Irupana, 1,100 m, *Beck 2962* (MO). SANTA CRUZ: Concepción–San Javier, *Evrard 8483* (BR); Chavez, El Carmen, 40 km S of Concepción on road to Lomerio, 750 m, *Killeen 1447* (MO); Río Ichilo, Valle Grande, Vallecito, 1,300 m, *Cárdenas 4006* (US). BRAZIL. MATO GROSSO SUL: near Bela Vista on road to Caracol, *Hatschbach & Silva 51585* (MBM, MO). PARAGUAY. WITHOUT LOCALITY: *Palmer s.n.* (US); Cerro San Bernardino, *Chodat 345* (G); Cordillera de Los Altos, *Fiebrig 348* (G, MO), *Hassler 1170*, *1503*, *3264* (G); Cerro de Tabati, *Schinini 21254* (CTES); Co. de Caacupe, *Schinini 23882* (CTES). AMAMBAY: Parque Nacional Cerro Cora, *Schinini & Bordas 20315* (CTES, K); Cerro Muralla, 1.5 km N of administración, *Brunner et al. 977* (MO); 7 km SW of administración, paso Nandejara, 250–300 m, *Simonis et al. 132* (U); Cerro Muralla, 300–350 m, 22°39'S, 56°03'W, *Casas & Molero 3960* (NY), *6061* (G, MO), *Solomon et al. 6782* (MO), *Zardini et al. 4120* (MO, PY); peñasco Guaiguy Hog, *Casas & Molero 4045* (NY); Río Aquidaban Nigui, Sierra de Amambay, *Hassler 11157* (G). ASUNCIÓN: Colonia Independencia, *Schinini 5644* (CTES), *Schinini & Bordas 21238*, *21234*, *21235* (CTES); Río Paraguay, *Balansa 578* (K). CAAZAPÁ: Río Tebicuari, *Kuntz 1492* (NY). CENTRAL: Asunción, Colonia Elisa, *Lindman 1823* (B); Río Paraguay, Villa Elisa, *Pedersen 58* (BR), *3150* (GH, US); Cerro Yaguaron, Yaguaron, *Arenas 953* (CTES). CORDILLERA: Caacupe, 25°20'S, 57°10'W, *Hahn 2028* (MO); Cerro Tabatí, *Zardini & Degen 3688* (MO, PY), *3692* (G, MO, PY); Serranía de Tobatí, Meseta Ybytú Silla, 297 m, 25°12'S, 57°07'W, *Zardini 8283* (CTES, FCQ, G, MO); Colonia Rosado, Tobatí, 200 m, 25°16'S, 57°07'W, *Schinini & Bordas 24882* (CTES). ÑEEMBUCÚ: Pilar, *Schulz 7865* (CTES). PARAGUARÍ: Cerro Acahay, 25°54'S, 57°9'W, 370 m, *Brunner 1249* (MO); Acahay, *Chodat 346* (G); Parque Nacional Ybycuí, *Duré 414* (MO). PRESIDENTE HAYES: Estancia La Golondrina, Villa Hayes, 24°55'S, 57°40'W, *Hahn 698* (MO); Trans-Chaco Hwy., Km 127, 150 m, *Gentry et al. 51990* (MO). SAN PEDRO: Río Apa-Aquidabán, Alto Paraguay, *Fiebrig 4149* (G, K); Río Tapiracuai, Alto Paraguay, 20–28°N, 59–63°W, *Woolston 1074* (K, NY, U, US); Dtto. Lima, Jejui, Estancia "Carumbe," *Pederson 9417* (K).

b. Anthurium paraguayense var. **coroicoanum** Croat, var. nov. TYPE: Bolivia. La Paz: between Caranavi and Guanay, 28.1 km N of Caranavi, near bridge over Río Coroico, 15°27'S, 67°50'W, 820 m, *Croat 51704* (holotype, MO 2825694; isotypes, B, K). Figures 228, 229, 232.

Differt a var. typicum per laminum ellipticum, nervis primarii lateralis reflexis.

Terrestrial to epiphytic; stem to 20 cm long, 1–4 cm diam.; roots dense, greenish, pubescent, short, thick and blunt at apex, 2–5 cm long, 4–5 mm diam.; cataphylls subcoriaceous, lanceolate, unribbed, 2.5–10 cm long, acute at apex, green (B & K yellow-green 9/2.5), drying dark to medium brown (B & K yellow 3/2.5), persisting semi-intact, eventually as coarse linear fibers or as a reticulum of fibers. *Leaves* erect to spreading; petioles 5.5–26 cm long, 4–5 mm diam., D-shaped to C-shaped, flattened with blunt to sharp margins adaxially, sometimes with a medial rib, rounded abaxially; geniculum paler than petiole, up to 11 cm remote from the base of the blade, 0.6–1 cm long; blades subcoriaceous, elliptic to ovate-elliptic, acute at apex, acute to prominently attenuate at base, 24–43 cm long, 8–25 cm wide, broadest at or near the middle, the margins broadly undulate; upper surface semiglossy to glossy, lower surface weakly glossy to semiglossy, both drying matte, brownish to brownish green; midrib sharply and acutely raised above, conspicuously paler than surface, convexly to obtusely raised at base below, becoming flat toward the apex, paler than surface; primary lateral veins 4–9 per side, departing midrib at 55–85° angle, weakly arcuate in the middle of the blade, ± reflexed at base, prominently raised above, raised below; interprimary veins weakly visible; tertiary veins visible; reticulate veins obscure; collective vein arising from about the middle of the blade, flat above and below, slightly darker than surface below, 1–7 mm from margin. *Inflorescences* erect-spreading, shorter than leaves; peduncle 12.5–26 cm long, 4 mm diam. when fresh, 1–2 mm diam. when dried, 0.8–3.8× as long as petiole, green (B & K yellow-green 8/7.5), terete; spathe reflexed to recurled, subcoriaceous,medium green, sometimes tinged with purple at margins (B & K yellow-green 6/7.5), lanceolate, 3–5 cm long, 0.8–2 cm wide, broadest near the base, inserted at 30–60° angle on peduncle, acute to short-acuminate at apex (the acumen inrolled, ca. 2 mm long), acute at base, the margins meeting at 45° angle; spadix greenish tinged with reddish to pale pink, also reported as becoming purplish post anthesis, long-tapered to nearly cylindroid, erect, 4.5–6.5 cm long, 4–8 mm diam. near base, 3–5 mm diam. near apex, broadest at the base; flowers rhombic to 4-lobed, 1.6–2.5 mm long, 1.8–2.2 mm wide, the sides jaggedly sigmoid; 7–9 flowers visible in principal spiral, (6)14–15 in alternate spiral; tepals semiglossy to matte, with droplets; lateral tepals 1–1.2 mm wide, the inner margins straight to convex, the outer margins usually 2-sided (meeting at ca. 90° angle), occasionally 3–4-sided; pistils weakly exserted, dark brownish purple; stigma slit-like, 0.5–0.6 mm long; stamens emerging rapidly in a regular sequence from the base, held shortly above the tepals, the laterals preceding the alternates by 13–14 spirals, the 3rd stamen preceding the 4th by ca. 2 spirals; anthers orange to reddish purple, 0.4–0.5 mm long, 0.6–0.8 mm wide, inclined over and obscuring the pistil; thecae oblong, 0.3–0.4 mm wide; pollen yellow fading to white, weakly fruity-scented. *Infructescence* with purple berries.

Anthurium paraguayense var. *coroicoanum* is known only from the vicinity of the type locality in La Paz Department, Bolivia, at 700 to 900 m in subtropical moist and subtropical wet forest life zones, and from Cusco, Peru, at 800 m in a subtropical rainforest life zone.

Anthurium paraguayense var. *coroicoanum* differs from the typical variety in its more or less elliptic rather than oblanceolate leaf blades, and by having the lowermost primary lateral veins directed at an almost 90° angle from the midrib to prominently reflexed, vs. prominently ascending in the typical variety. Another character distinguishing the two taxa is berry color: purple in var. *coroicoanum*, dark red in var. *paraguayense*.

The new variety is named for the type locality, near the Río Coroico.

BOLIVIA. LA PAZ: Caranavi–Guanay, 27.8-28.1 km N of Caranavi, near bridge over Río Coroico, 820–865 m, 15°27-33'S, 67°45-50'W, *Croat 51657* (MO), *51704* (B, K, MO, NY). SANTA CRUZ: Prov. Ichilo, Parque Nacional Amboro, 15 km SE up the Río Pitasama from Río Surutú, 700 m, 17°44'S 63°40'W, *Solomon & Urcullo 14159* (MO). PERU. CUZCO: Prov. Paucartambo, Río Tono, N of Patria, Cosnipata Valley, 800 m, 13°07'S, 71°12'W, *Wachter et al. 141* (F, MO).

Anthurium pendulifolium N. E. Br., Gard. Chron. 36: 362. 1904. TYPE: unknown locality, possibly Colombia, *Kew H 457/83* (holotype, K). Figures 9, 230, 233, 234, 255.

Epiphytic, rarely terrestrial; stem pendent, 20–30 cm long, 1.5–3.5 cm diam.; leaf scars reported as conspicuous, ca. 2.8 cm wide; roots moderately dense, descending, brown, 6 mm diam.; cataphylls moderately coriaceous, broadly lanceolate, scarcely 1-ribbed, 4–19 cm long, acuminate at apex with subapical apiculum, green, drying brown (B & K yellow-red 9/2.5), persisting as coarse linear fibers, the apex remaining intact. *Leaves* spreading-pendent to pendent; petioles 27–65 cm long, 5–10 mm diam., terete to subterete or thicker than broad, slightly flattened adaxially, rounded abaxially, the surface minutely pale-speckled; geniculum paler and thicker than petiole, 1.5–3.5 cm long; sheath 2.5–12 cm; blades coriaceous to subcoriaceous, oblong to oblanceolate, acuminate at apex, acute to rounded (rarely subcordate) at base, 64–190(207) cm long, 16–32(42.5) cm wide, broadest above the middle, the margins weakly revolute, broadly and weakly undulate; upper surface glossy to semiglossy, light to medium green (B & K yellow-green 5/10), lower surface matte, paler; midrib convexly to obtusely raised, paler than surface above, obtusely angled below; primary lateral veins (8)11–15 per side, departing midrib at 45° angle, arcuate-ascending to the margin, sunken in shallow grooves above, paler than surface, raised below; interprimary veins few, obscure; tertiary veins obscure above, scarcely raised and darker than surface below; collective vein arising in the lower third to about the middle of the blade, less prominent than primary lateral veins, (4)7–14 mm from margin. *Inflorescences* erect-spreading; peduncle 35–52 cm long, 0.5–1 cm diam., 0.5–1.7× as long as petiole, terete; spathe reflexed and twisted, subcoriaceous, pale yellowish green to creamy white, violet at margins and at base (B & K yellow-red 9/10), oblong-lanceolate, (9)20–30(60) cm long, 1.5–4.8 cm wide, broadest just above the base, acuminate at apex (the acumen inrolled), acute at base; stipe 8–12 mm long in front, 2–5 mm long in back; spadix reddish violet to reddish purple (B & K purple 2/7.5 to red-purple 7/5–10), tapered, curved, 19.5–38 cm long, 4–9 mm diam. midway, 2–4 mm diam. near apex; flowers weakly 4-lobed to rhombic, 2.5–3.5 mm long, 1.7–3.3 mm wide, the sides straight to sigmoid; 12–16 flowers visible in principal spiral, 8–27 in alternate spiral; tepals matte and weakly punctate; lateral tepals 1.4–2.2 mm wide, the inner margins broadly rounded to somewhat concave, the outer margins 3–5-sided; pistils glossy, weakly exserted, green; stigma brushlike; stamens emerging irregularly; filaments fleshy, translucent, minutely papillate, exserted 0.5 mm; anthers creamy white to yellow, 0.5 mm long, 0.6–0.7 mm wide, inclined over the pistil; thecae ovoid-ellipsoid to pyriform, weakly divaricate; pollen yellow fading to white. *Infructescence* pendent to spreading-pendent, sometimes coiled; spathe withered; spadix 27–55 cm long, 1–2 cm diam., with berries scattered throughout; berries lavender, becoming white at maturity, obovoid-oblong, rounded at apex, 10–11 mm long, 5–6 mm diam.; pericarp thickened; mesocarp mealy, white; seeds 1–2 per berry, brown, oblong, (5.5)7.3–7.8 mm long, 2.8–3 mm diam., 1.3 mm thick.

Anthurium pendulifolium ranges from Colombia (Amazonas and Putumayo) to northern Peru as an epiphyte at 90–550 m in tropical moist and tropical wet forest. Most collections are from the upper Río Napo and Río Aguarico in northern Ecuador (Napo), and also from around Iquitos in Loreto, Peru. It has also been collected in northern Amazonas, in Peru along the Río Cenepa and the Río Santiago, as well as along the lower Río Pastaza in northwestern Loreto. It is to be expected throughout lowland Ecuador and northwestern Loreto in Peru.

This species is distinguished by its oblong-oblanceolate leaf blades which are pendulous and dry pale green or yellowish green (the type specimen, of cultivated origin, has pale brown leaves, but this may be due to its age of nearly 100 years). Also distinctive are the moderately long petioles (up to ½ as long as the blades) and pale purple berries which become whitish in age. *Anthurium pendulifolium* may be confused with *A. atropurpureum* var. *arenicola*, with leaves drying the same green color and occurring in the same area. The latter differs from *A. pendulifolium* in its erect-spreading, rosulate habit, broadly oblanceolate leaf blades, shorter petioles, and conspicuously sunken tertiary veins (when fresh).

Anthurium pendulifolium was originally described from cultivated material thought to be from Colombia. While no Colombian material closely matches the type, much of the material collected in Ecuador matches it well.

Common names for this species include "yakiya sugkip" (Huambisa tribe, Río Santiago, Amazonas, Peru); "kankur nuka" (Río Santiago); "meko uko" (Siona Indians, Putumayo, Colombia); "fam'be" (Río San Miguel, Putumayo, Colombia); and "bagre panga" (Río Lagartacocha, Napo, Ecuador). The mashed, cooked leaves are used in a water bath by the Siona Indians (Putumayo, Colombia) to relieve bone aches and rheumatism.

WITHOUT LOCALITY: cultivated at Kew, *Kew H 457/83* (K). COLOMBIA. AMAZONAS: Puerto Nariño, Parque Nacional Amacayacu, 100 m, 3°45'S, 70°15'W, *Vásquez et al. 12506* (MO). PUTUMAYO: Buena Vista, *Piaguaje 28* (ECON); Río San Miguel, Santa Rosa de Sucumbios, 380 m, *Schultes 3609* (GH). ECUADOR. NAPO: Laguna Grande, Pica Saladero de Dantas, Cuyabeno, 0°00'00", 76°12'45"W, *Jaramillo 6852* (MO, QCA); 265 m, *Nielsen 76272* (AAU, MO); Lago Agrio–Coca, 26 km N of Coca, 450 m, 0°29'S, 76°55'W, *Croat 50420* (MO); Coca–Hollín, Huaticocha, 500 m, 0°45'S, 77°29'W, *Palacios et al. 3543* (MO); Payamino, Reserva Floristica "El Chuncho," 250 m, 0°0'S, 77°01'W, *Cerón & Palacios 3000* (MO, QCNE); ridge W of Cotapino, parallel to Río Cotapino, 360 m, 0°40'S, 77°20'W, *Whitmore 718* (K); trail to Shushufindi, WSW of San Pablo de Las Secoyas, 300 m, 0°15'S, 76°21'W, *Brandbyge & Asanza 32892* (AAU, MO); Lago Agrio–Puerto El Carmen de Putumayo, 15 km E of Tarapoa, 91.7 km E of Lago Agrio, 260 m, 0°08'N, 76°23'W, *Croat 58579* (MO, QCA); 28 km W of Tarapoa, 48 km E of Lago Agrio, 240 m, 0°06'N, 76°33'W, *Croat 58610* (BM, MO, QCA, US, W); rd. to Agua Pungo, Tena, 1.5 km past bridge over Río Mishahuallí, 550 m, 0°59'S, 77°47'W, *Croat 58825* (MO); Estación Biológica Jatún Sacha, 8 km E of Mishahuallí, 450 m, *Palacios 2863* (MO); Parque Nacional Yasuní, 200 m, 0°55'S, 76°11'W, *Cerón & Hurtado 4012* (MO); Cantón Aguarico, lagunas de Garza Cocha, 200 m, *Cerón & Gallo 4953* (MO, QCNE); Cantón Tena, headwaters of Río Huambuno, 6 km NNW of Ahuano, 440 m, 1°00'S, 77°40'W, *Kohn 1155* (MO); Río Aguarico, E of Lago Agrio, road to Cepe Ferry Crossing, 450 m, 0°02'N, 76°50'W, *Croat 50427* (MO), *58513* (MO, P, QCA); Santa Cecilia, 200 m, 0°04'N, 76°58'W, *Sparre 13043* (S); Río Lagartococha, Redondo Cocha, 190 m, 0°35'S, 75°15'W, *Lawesson et al. 44424* (AAU). PASTAZA: Río Curaray, Lagunas Patoamo, 230 m, 1°30'S, 76°30'W, *Palacios & Neill 762* (MO, NY, QAME). PERU. AMAZONAS: Río Cenepa, *Croat 57196* (MO); Río Santiago, La Poza, 400 m (180 m), *Huashikat 150* (MO); Río Santiago, Quebrada Caterpiza, 2–3 km behind community of Caterpiza, 200 m, 3°50'S, 77°40'W, *Tunqui 784* (MO). LORETO: vic. Yanamono, Explorama Camp, 130 m, 3°28'S, 72°50'W, *Croat 61760* (AMAZ, MO), *66057* (MO); Prov. Alto Amazonas, Río Pastaza, Uchpayaco–Rimachi, 4°20'S, 76°40'W, *Díaz et al. 1287* (MO); Prov. Loreto, Pucayacu, native community of Shimaco–Urarina, *Vásquez 6033* (MO); Prov. Maynas, Iquitos Region, Río Itaya, 10 km above Iquitos, *Croat 19151* (MO); Quebrada de Bo, ca. 90 m, *Rimachi 6490* (IBE); Río Manití, Recreo, NE of Iquitos, 115 m, 3°42'S, 72°50'W, *Vásquez & Jaramillo 1123* (MO); Río Momón, tributary of Río Nanay, Iquitos, *Davidson & Jones 9802* (LAM); Sucusari, 116 m, 72°55'W, 3°20'S, *Vásquez & Jaramillo 8247* (MO); 11 km from Río Nanay, near Iquitos, Quebrada Momoncillo, 200 m, 3°43'S, 73°20'W, *Croat 51224* (COL, F, GH, M, MBM, MO, NY, SEL, U), *Davidson & Jones 9517* (LAM); Río Amazonas, Quebrada Panguanillo, Aucayo, 90 m, *Rimachi 6041* (IBE); Río Tacshacuraray, tributary of Río Napo, 2°40'S, 73°30'–74°20'W, *Croat 20380* (MO). SAN MARTÍN: Tarapoto–Yurimaguas, Km 54, Lamas, 350 m, 6°23'S, 76°18'W, *Knapp 8262* (MO).

Anthurium penningtonii Croat, sp. nov. TYPE: Ecuador. Napo: between Quito & Baeza, S of road above jct. of road to Baeza & to Lago Agrio, 1,800 m, *Croat 58491* (holotype, MO 3183150; isotypes, QCA, VEN, RSA, K, US). Figures 235, 236, 256, 257.

Planta terrestris aut raro epiphytica; internodia brevia, 1–3 cm diam.; cataphyllum lanceolatum, persistens semiintactum mox fibris stramineis findens; petiolus 11–31 cm longus, 4–8 mm diam., subteres ad triangularis; lamina late elliptica, raro oblanceolata, 35–61 cm longa, 10–19 cm lata; nervis primariis lateralibus 24–43 utroque, acute elevatis; pedunculus 21–52 cm longus, 3–4 mm diam.; spadix viridis, 2.5–5.5 cm longus, 3–5 mm diam.

Terrestrial, rarely epiphytic; stem to 50 cm long, 1–3 cm diam.; roots dense, drying whitish to tan, moderately elongate; cataphylls thin, lanceolate, 6–13 cm long, acuminate at apex, drying reddish brown, persisting semi-intact, quickly weathering to straw-colored fibers. *Leaves* erect-spreading; petioles 11–31 cm long, 4–8 mm diam., subterete to triangular, flattened to broadly convex adaxially, sometimes with the margins sharp, rounded or sharply 1-ribbed abaxially; geniculum slightly paler and scarcely thicker than petiole, (0.6)1–3 cm long; sheath 1.5–3 cm long; blades coriaceous to subcoriaceous, broadly elliptic, rarely somewhat oblanceolate, shortly acuminate at apex, acute to narrowly acute at base, 35–61 cm long, 10–19 cm wide, broadest near the middle, the margins flat to slightly revolute; upper surface weakly glossy to semiglossy to glossy, dark to medium green, lower surface semiglossy, conspicuously paler; midrib convexly raised at base, becoming sharply acute toward the apex above, slightly paler than surface, acutely raised below; primary lateral veins 24–43 per side, departing midrib at 40–60° angle, straight to the collective vein, usually prominently and sharply raised above, flat to sunken below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins obscure, prominulous above and below on drying; reticulate veins not visible; collective vein arising from the base, equally as prominent as primary lateral veins, 10–15 mm from margin. *Inflorescences* erect; peduncle 21–52 cm long, 3–4 mm diam., 1–2.2× as long as petiole, green to purple, terete, sometimes with many weakly to prominently raised striations; spathe reflexed or rarely spreading, subcoriaceous, green, usually tinged with purple, oblong-lanceolate, 3.5–7 cm long, 0.6–1.3 cm wide, broadest near the base, acute to abruptly acuminate at apex, acute at base; spadix green, usually tinged with purple to purplish brown, sessile or stipitate to 2 mm, scarcely tapered, erect, 2.5–5.5 cm long, 3–5 mm diam. midway, 3–4 mm diam. near apex; flowers square to rhombic, 1.4–2 mm long, 1.4–1.8 mm wide, the sides straight; 5–9 flowers visible in principal spiral, 4–6 in alternate spiral; tepals matte, minutely papillate; lateral tepals 1.1–1.2 mm wide, the inner margins rounded, the outer margins 2-sided; pistils emergent, glossy; stamens exserted; anthers pink-orange, 0.4–0.5 mm long, 0.5 mm wide; thecae oblong-ellipsoid, slightly divaricate; pollen pale orange fading to white. *Infructescence* erect; spathe persisting; spadix 8–10 cm long, 1.3–1.7 cm diam., with berries scattered throughout; berries (immature) green, emergent ca. halfway, obovoid, shortly beaked at apex on drying, ca. 6.5 mm long, ca. 4 mm diam.; pericarp with raphide cells; seeds 2 per berry, oblong-obovoid, flattened, beaked at apex, 4–4.5 mm long, 2.5–2.7 mm wide, 1.5–1.8 mm thick, with a gelatinous appendage at one end.

A member of series *Multinervia*, *Anthurium penningtonii* ranges from the Amazon slopes of Ecuador to northern Peru on both slopes of the Cordillera Oriental and the Cordillera Central at elevations of (800)1,000 to 2,500 m. The species is ecologically variable. In Ecuador it is known from premontane moist, premontane wet, lower montane moist, and lower montane wet forest life zones, while in Peru it is known from premontane rain and montane rain forest life zones.

This species is distinguished by its broadly elliptic, green-drying leaf blades with sharply raised (knife-edge) major veins, and by its rather remote collective vein (1–1.5 cm from the margin).

Anthurium penningtonii is not confused with any other species on the eastern side of the Andes, but *A. pallatangense*, from the Pacific slope of Ecuador, is very similar, differing mainly in its dark purple to maroon spadix. It occurs in drier life zones as well.

Some material from Morona–Santiago (*Stein 2826*, *Madison et al. 3457*, *Madison 2605*) has sharply triangular petioles. Considering the variation in the vicinity of Baeza alone (petioles terete to flattened adaxially and sometimes sharply 1-ribbed abaxially, sometimes with the margin sharp on one side), these collections are best placed in *A. penningtonii* and agree well in other characters. Another collection from Morona–Santiago (*Steyermark 53610*) differs in having the leaf blades attenuate at the base, rather than acute to narrowly acute. More collections from southern Ecuador and northern Peru are needed to determine the range of variability in this taxon.

The new species is named in honor of T. D. Pennington, a member of the 1960 Oxford University expedition to Ecuador and one of the first collectors of this species.

ECUADOR. MORONA–SANTIAGO: Limón (General Plaza)–Macas, 8 km N of Limon, 1,100 m, 2°57′S, 78°25′W, *Stein 2826* (B, K, MO, QCNE, US); 7–8 km N of Gualaquiza on road to Indanza, 1,450 m, *Harling & Andersson 24199* (GB, MO); Tumbez–Tucumbatz, Km 20 on road Gualaquiza–Indanza, 1,600 m, *Harling & Andersson 24360* (GB); Cordillera de Cutucu, Rio Chihuasi, 25 km SE of Lagrono, 800–1,000 m, *Madison 2605* (SEL); Lagrono–Yaupi, 1,600 m, 2°46′S, 78°06′W, *Madison et al. 3457*, *3502* (SEL); Río Tintas, Campanas–Arenillas, 10 leagues SE of El Pan, 2,195 m, *Steyermark 53610* (US, NY). NAPO: Lago Agrio–Baeza, 1,940–2,000 m, 0°15′S, 77°45′W, *Oellgaard et al. 35767* (AAU); Quito–Baeza, S of rd. above jct. of rds. to Baeza & Lago Agrio, 1,800 m, *Croat 58491* (K, MO, QCA, RSA, US, VEN); Lago Agrio–Baeza, 32.8 km E of Baeza turn-off, 1,840 m, 0°17′S, 77°46′W, *Croat 58730* (B, CM, MO, QCA); Baeza–jct. of road to Lago Agrio, 2,500 m, *Croat 49439* (MO, NY, QCA); Baeza–Tena, 37.7 km S of Baeza, 59 km N of Archidona, 1,700 m, 0°36′S, 77°51′W, *Croat 58781* (CAS, MO, QCA); Cantón Archidona, Carretera Hollín–Loreto, Km 50, Guagua Sumaco, 1,000 m, *Cerón & Hurtado 6565* (MO); Km 25, Challua Yacu, 1,200 m, *Cerón & Hurtado 6455* (MO); Baeza–Lago Agrio, 19.7 km NE of El Chaco, 39 km NE of jct. of road to Tena, 1,750 m, *Croat 58529* (MO, QCA); Río Oyacachi, 1,620 m, 0°20′S, 77°55′W, *Croat 50297* (M, MO); Km 142, 1,800 m, *Croat 49454* (IBE, MO, NY); Cerro Antisana, 1 mi. NE of Borja, NE of Baeza, 1,850 m, 0°25′S, 77°50′W, *Grubb et al. 1267c* (K); Cordillera de Guacamayos, S slope, Baeza–Tena, above Jondachi, 1,500 m, *Harling & Andersson 16342* (AAU, MO); Volcán Sumaco, Cotundo–Coca, 15 km E of Baeza–Tena road, 1,300 m, 0°40′S, 77°40′W, *Palacios & Neill 1559* (MO). TUNGURAHUA: Río Negro, 1,200 m, 1°24′S, 78°13′W, *Harling & Andersson 17240* (GB). ZAMORA–CHINCHIPE: La Saquea–Yacuambi, 1 km N of Chapintza road, 1,100 m, *Harling & Andersson 23868* (GB). PERU. AMAZONAS: Serranía de Bagua, 17 km E of La Peca, 1,850–1,900 m, *Gentry et al. 22969* (MO); Prov. Bagua, 20 km on trail E of La Peca, 2,190 m, *Barbour 2735*, *2746* (MO). CAJAMARCA: Cutervo, San Andrés de Cutervo, Parque Nacional de Cutervo, between Saucedal and Chorro Blanco, 2,250 m, *Díaz & Osores 2932* (MO, USM); between Saucedal and Pajonal, 2,300 m, *Díaz & Osores 2979* (MO, USM). SAN MARTÍN: Moyobamba–Chachapoyas, Km 380, E of Río Nieva, 1,750 m, 5°44′S, 77°32′W, *Croat 58215* (MO, USM); Rioja–Pomacocha, Km 291, Venceremos, 1,850 m, 5°45′S, 77°40′W, *Gentry et al. 45504* (MO).

Anthurium plowmanii Croat, Candollea 42(2): 811–813. 1987. TYPE: Brazil. Amazonas: Mpo. Manaus, Chacaras de Taruma, 16 km NW of Manaus, 60 m, 2°51′S, 59°50′W, *Croat & Nelson 53563* (holotype, INPA; isotypes, B, G, K, IBE, MO, NY, RSA, US). Figures 237–239, 240, 258.

Epiphytic or epilithic; stem 10–30 cm long, 2.5–6 cm diam.; leaf scars ca. 4 cm wide; roots dense, ascending or descending, whitish green, shortly pubescent, short or elongate, tapered, 4–6 mm diam.; cataphylls coriaceous, 5–20(27) cm long, obtuse to acute at apex, drying reddish brown (B & K yellow-red 4/5), persisting as a reticulum of fibers, the epidermis drying thin and flaking off, revealing the thin, reddish brown, hairlike fibers beneath. *Leaves* erect to spreading, reported to 2 m long; petioles (7.5)10–40(50) cm long, 4–20 mm diam., U- to C-shaped, narrowly and obtusely sulcate adaxially with the margins blunt, rounded to rarely 1–2-ribbed abaxially, the surface pale-speckled; geniculum thicker than petiole, becoming fissured transversely with age, 0.5–2 cm long; sheath ca. 3 cm long; blades coriaceous, obovate to oblanceolate or elliptic to broadly elliptic, acuminate to obtuse at apex (the acumen inrolled or downturned), acute to attenuate (rarely long-attenuate), or obtuse at base, (24)40–125(200) cm long, (6)20–55(66) cm wide, broadest at or near the middle, the margins prominently and broadly undulate; upper surface matte to semiglossy or weakly glossy, dark green, lower surface matte to weakly glossy, concolorous with the upper surface or slightly paler; midrib flat to angular at base, becoming prominently and convexly raised (almost round-raised, with narrow sulcus along each side) and narrowly angular toward the apex above, prominently thicker than broad to weakly 2–3-ribbed at base, becoming prominently and convexly raised toward the apex below; primary lateral veins (4)7–15 per side, departing midrib at (30)45–65° angle, ascending ± straight to the margin or slightly arcuate-ascending, prominently and convexly raised above and below, more so below; interprimary veins obscure; collective vein arising from near the apex or absent, if present flat to weakly sunken above, flat to weakly raised below, 4–6 mm from margin. *Inflorescences* erect to erect-spreading; peduncle (2)6–32 cm long, 3–9 mm diam., 0.2–0.3 × as long as petiole, plain green or heavily to slightly tinged with red, purple, or maroon, terete to ribbed abaxially; spathe semi-erect to spreading to reflexed or rolled up, subcoriaceous to coriaceous, violet purple or green tinged with purple, lanceolate to broadly lanceolate, (4)5–26(29) cm long, (0.5)1–3.5 cm wide, broadest near the base, inserted at 40–55° angle on peduncle, acute to long-acuminate at apex (the acumen inrolled), obtuse to acute or sometimes slightly decurrent at base, the margins meeting unequally, thick, rolling down at edges; stipe 1–20 mm long in front, 1–3 mm long in back; spadix green to dull maroon to green tinged with violet to violet-purple, tapered to cylindroid, longer than peduncle, (7)10–46 cm long, 10–20 mm diam. near base, 3–10 mm diam. near apex, broadest at the base; flowers square to rhombic, 1.5–2.5 mm long, 1.1–2.5 mm wide, the sides ± straight to jaggedly sigmoid; (8)10–16(18) flowers visible in principal spiral, 6–10 in alternate spiral; tepals matte, minutely and densely papillate; lateral tepals 0.6–1.2 mm wide, the inner margins straight to convex, the outer margins 2-sided; pistils emergent, weakly raised before the stamens emerge, reddish to dark purple; stigma linear, 0.2–0.6 mm long; stamens emerging in a regular sequence from the base, the laterals preceding the alternates by ca. 5 spirals; filaments holding anthers above the tepals; anthers orange, ca. 0.6–0.8 mm long, 0.8–0.9 mm wide, inclined over and obscuring the pistil; thecae ellipsoid to obovoid, not divaricate; pollen yellow to orange fading to cream, yeasty-scented. *Infructescence* erect to pendent; spathe deciduous, leaving a coarse scar; spadix 5–25 cm long, 1–3 cm diam., the apical ⅓ withered, fruits developing in the lower ⅔ only; berries red, oblong-obovoid, slightly rounded at apex (the stigma button-shaped), 8–12 mm long, 3–6 mm diam.; mesocarp juicy, sweet, translucent; seeds 1–2 per berry, brown, densely speckled with translucent dots in rehydrated specimens, oblong to ovoid, 5–6 mm long, 2–3 mm diam., 1.5–2 mm thick, with sticky appendage at the apex (forked in rehydrated specimens).

Anthurium plowmanii ranges from Brazil (Acre, Amazonas, Mato Grosso, and Rondônia) to Bolivia (La Paz, Pando, and Santa Cruz), Paraguay (Amambay) and Peru (San Martín) at 50–900 m, typically in the dry forest life zones of Peru and the varzea and terra firme habitats of Brazil.

A large epiphytic or epilithic species, *A. plowmanii* is unusual in sect. *Pachyneurium* by virtue of its spadix, which is longer than (or rarely as long as) the peduncle. This feature is shared only with *A. solomonii* (see discussion under the latter for distinctions from *A. plowmanii*). Also distinctive are the C- to U-shaped petioles with blunt adaxial margins, otherwise of rare occurrence in the section. Typical of *A. plowmanii* is the gradual disintegration of the distal (presumably unpollinated) portion of the spadix in the fruiting stage with, at most, only the weathered axis remaining. Fruiting spadices are thus regularly much shorter than flowering spadices, quite opposite the normal situation in the section.

Some atypical material of cultivated origin is included here under *A. plowmanii*, such as *Casari 165*, which differs in its unusually coriaceous leaf blades that are oblong-attenuate (vs. usually acute to attenuate) at the bases. The infructescence and other features are, however, typical. *Croat 53701*, received from and cultivated at the sitio of Roberto Burle-Marx in Rio de Janeiro, Brazil, has lanceolate (vs. obovate to elliptic) leaf blades with unusually prominent venation and notably olive-green coloration on drying. Photos of this collection taken in Brazil closely resemble typical material, however.

BOLIVIA. WITHOUT LOCALITY: collected by F. Fuchs of Homestead, Florida, *Croat 53542* (GH, MO, UCLA). COCHABAMBA: Río Grande, *Velasco 7192* (NY). LA PAZ: Prov. Iturralde, *Solomon 16940* (MO); Luisita, 180 m, 13°05′S, 67°15′W, *Haase 266* (MO). PANDO: Lago Bay, black water lake formed by Río Arroyo, upstream from junction with Río Manuripi, 11°57′S, 68°40′W, *Sperling & King, 6564* (MO); Río Madeira, Cachoeiras Misericordia–Madeira, *Prance et al. 6598* (NY); 4 km above Abuña, *Prance et al. 6271* (INPA); Río Madre de Dios, Federico Roman, Loma Alta, 110 m, *Solomon 17068* (MO); Manuripi, upstream from Riberalta, 220 m, 10°55′S, 66°8′W, *Daly et al. 2042* (NY). SANTA CRUZ: *Weddell 3518* (P); Andres Ibanez, 12 km E of Santa Cruz--Cotoca, 375 m, 17°46–47′S, 63°04′W, *Nee 34009* (NY); ca. 40 km S of Asunción dos Guarayos, Nufles de Chaves, 15°55′S, 63°05′W, *Hopkins et al. 218* (MO); Serranía de Santiago, N slope, Chiquitos, 10 km ENE of Santiago de Chiquitos, 900 m, 18°20′S, 59°28′W, *Daly et al. 2243* (MO). BRAZIL. ACRE: Mpo. Sena Madureira. Rio Iaco, *Cid & Nelson 2757* (INPA). AMAZONAS: cultivated, INPA campus, Manaus, *Nelson 1335* (MO); N of Coreiro, 10 km downstream from Manaus, *Leppard 1645* (K); Solimões, Mamia, *Kuhlman 1191* (RB); Lago do Janauari, Manaus, *Coelho 638* (INPA); Manaus, 50 m, *Croat 53563* (B, G, IBE, INPA, K, MO, NY, RSA, TEX, US); Rio Acre, behind Santa María, W bank of Rio Acre, Boca do Acre, *Prance et al. 2361* (INPA), *2371* (INPA, NY, US); Rio Madeira basin; Humayta, near Livramento, on Rio Livramento, *Krukoff 6767* (NY). MATO GROSSO: Aripuanã, Cidade Humboldt, 10°12′S, 59°21′W, *Rodrigues 9816* (INPA); Chapada dos Guimaraes, *Hutchison 8553* (UEC); Porto Espiridião–Porto Velho, 286 km NW of Porto Esperidião, on BR-364-MT, *Hutchison 8602* (MO, UEC); Urucum, Corumba, 19°00′S, 57°35′W, *Pereira, Egler & Graziela 447* (RB); Serra Ricardo Franco, 350 m, 15°S, 60°W, *Windisch 1514* (K). RIO DE JANEIRO: cultivated, Rio de Janeiro, base of Pedra Bonita, Rue Elviro Niemeyer 14, *Casari 165* (GUA); cultivated by Burle Marx, San Carlos, *Croat 53701, 53710* (MO). RONDÔNIA: Rio Madeira, Riberão, Cachoeira Misericordia, *Prance et al. 6721* (INPA, NY, US); Abunã–Penha Colorado, *Prance et al. 8725* (INPA, NY, US); Mpo. Costa Marques, ca. 5 km NW of Costa Marques, 150 m, 12°25′S, 64°14′W, *Nee 34548* (NY). PARAGUAY. AMAMBAY: Cerro Chanchito, 22°26′S, 56°3′W, *Schinini & Bordas 20398* (K); Cerro Memby, cultivated in Asunción, *Krapovickas & Schinini 28533* (K); Sierra de Amambay, Montes Barrancas, Piedra Esperanza, *Hassler 10640* (G); Parque Nacional Cerro Cora, 300 m, 22°39′S, 56°03′W, *Solomon et al. 6987* (MO); summit of Cerro Muralla, *Casas 3955* (NY). PERU. WITHOUT LOCALITY: cultivated at SEL, #81-76-10, and at MO, *Plowman 6011 B* (MO, NY, TEX). SAN MARTÍN: Tarapoto–Juanjui, Km 24–25, 300–500 m, 6°40′S, 76°20′W, *Croat 50987* (F, MO), *Plowman 6044* (GH); Río Huallaga, 29–31 km S of Tarapoto, near El Abra, 450–540 m, 6°40′S, 76°20′W, *Gentry & Smith 45091* (MO); 350 m, 6°35′S, 76°25′W, *Gentry et al. 37733* (MO); Río Mayo, 6 km S of Tarapoto–Moyobamba Rd. at Km 15, Cunumbigue village, 350 m, 6°23′S, 76°39′W, *Croat 51094* (CM, F, K, MO, RSA).

Anthurium pranceanum Croat, sp. nov. TYPE: Brazil. Acre: Rio Moa between Cachoeira Grande and Serra de Moa village, *Prance et al. 12640* (holotype, INPA; isotypes, F, K, NY, U, US). Figure 241.

Planta terrestris; internodia brevia, 1–1.5 cm diam.; cataphyllum lanceolatum, persistens semi-intactum; petiolus 35–65 cm longus, 4–8 mm diam., subteres, adaxile sulcatus; lamina ovato-elliptica ad ovata, 40–70 cm longa, 17–26 cm lata; geniculum 4–20 cm remotum; pedunculus 24–40 cm longus; spatha lanceolata, violaceus, ca. 4 cm longa, 1.2 cm lata; stipes 1–10 cm longus; spadix violaceus, ca. 5 cm longus, 5–6 mm diam.

Description based on dried material only. Terrestrial; stem 1–1.5 cm diam.; roots densely and finely pubescent, ca. 2–4 mm diam.; cataphylls subcoriaceous, lanceolate, ca. 10 cm long, acute at apex, reddish brown, persisting semi-intact. *Leaves* with petioles 35–65 cm long, 4–8 mm diam., subterete, sulcate adaxially, rounded abaxially; geniculum slightly darker than petiole, ca. 1 cm long, appearing remote from base of blade by 4–20 cm; blades moderately coriaceous, ovate-elliptic to ovate, shortly acuminate at apex, broadly rounded then abruptly attenuate at base, 40–70 cm long, 17–26 cm wide, broadest at or below the middle, lower surface dark glandular-punctate; both surfaces green to yellowish green; midrib convexly raised above, acutely raised below; primary lateral veins 6–9 per side, departing midrib at 50–60° angle, ± straight, becoming arcuate near the margin, apparently convexly raised above and below; tertiary veins weakly raised; collective vein arising from about the middle of the blade, apparently sunken above, raised below, less prominent than primary lateral veins, 7–24 mm from margin. *Inflorescences* erect, shorter than leaves; peduncle 24–40 cm long; ca. 2–5 mm diam., about half as long as petiole, terete; spathe recurled, membranous, violet, lanceolate, ca. 4 cm long, ca. 1.2 cm wide, broadest near the base, narrowly acute at base; stipe 15–28 mm long in front, 1–10 mm long in back; spadix violet, weakly tapered, ca. 7.7 cm long, 5–6 mm diam. near base, ca. 3 mm diam. near apex; flowers rhombic, ca. 2 mm in both directions, the sides ± straight to smoothly sigmoid; 4–6 flowers visible in either spiral; tepals smooth when dried; lateral tepals 1 mm wide, the inner margins straight, the outer margins 2-sided. *Infructescence* not seen.

Anthurium pranceanum is known only from the type collection made near the Rio Moa in Acre, Brazil, below 300 m.

This species is distinguished by its ovate to ovate-elliptic leaf blades which are dark glandular-punctate below and have the geniculum situated 4–20 cm below the base of the blade.

Anthurium pranceanum is apparently most closely related to *A. krukovii*, which also has a remote geniculum but lacks dark glandular punctations on the lower surface of the leaf blade. It also bears some resemblance to *A. bonplandii* subsp. *bonplandii*, which occurs further north in the Amazon basin and often has similar dark glandular punctations. The latter differs in its proportionately narrower leaf blades which are acute to attenuate at the base and do not have a remote geniculum.

The species is named in honor of G. T. Prance, one of the foremost explorers of Brazilian Amazonia, who has collected numerous Brazilian Araceae, including the type of *Anthurium pranceanum*.

BRAZIL. ACRE: Rio Moa, Cachoeira Grande–Serra da Moa village, *Prance et al. 12640* (F, INPA, NY, U, US).

Anthurium prolatum Croat & R. A. Baker, Brenesia 16(Suppl. 1): 72. 1979. TYPE: Costa Rica. Heredia: Istarú Farm, Tirimbina, Sarapiquí, 220 m, *Lent 2140* (holotype, F-1724125). Figures 242–245, 259.

Epiphytic; stem short, 1–2.5 cm diam.; roots few, descending, pale greenish, ± smooth, slender, 3–5 mm diam.; cataphylls moderately coriaceous, narrowly lanceolate, 7.5–36 cm long, acute at apex with subapical apiculum, medium green, drying tan, persisting as fine linear fibers. *Leaves* spreading to pendent; petioles 1–35 cm long, 3–6 mm diam., terete to subterete, weakly flattened to flattened or rounded adaxially, rounded abaxially, the surface weakly pale-speckled; geniculum thicker and paler than petiole, 0.5–1 cm long; blades subcoriaceous to moderately coriaceous, strap-shaped to narrowly oblong-elliptic, long-acuminate at apex (the acumen weakly apiculate), narrowly acute to obtuse to narrowly rounded at base, (35)83–142 cm long, 3.5–10 cm wide, broadest at or near the middle, the margins weakly undulate; upper surface semiglossy, dark green, lower surface semiglossy to glossy, paler; midrib above acutely raised at base, becoming weakly sunken toward the apex, below prominently higher than broad at base, becoming convexly raised toward the apex and paler than surface; primary lateral veins more than 15 per side, departing midrib at ca. 55° angle, ± straight, obscure to weakly sunken above, somewhat raised and darker than surface below; interprimary veins numerous, almost as conspicuous as primary lateral veins; tertiary veins obscure above, somewhat darker than surface below; reticulate veins prominulous above and below; collective vein arising from near the base, sunken above, weakly raised and darker than surface below, more prominent than primary lateral veins, 3–4 mm from margin. *Inflorescences* with peduncle to 39 cm long, ca. 9 mm diam., slightly longer than petiole, several-ribbed on drying; spathe spreading, subcoriaceous, pale green, linear-lanceolate, to 29 cm long, ca. 1.5 cm wide, broadest near the base, inserted at 70° angle on peduncle, acuminate at apex (the acumen minutely inrolled), acute at base; spadix brown (fide labels) probably greenish purple, sessile, very narrowly cylindroid, slightly tapered at apex, to 60 cm long, 7–8 mm diam. near base, ca. 4 mm diam. near apex; flowers (dry) rhombic, (2.7)3.4–4.5 mm long, 1.8–2.2 mm wide, the sides jaggedly sigmoid; 7–8 flowers visible in principal spiral, 5–6 in alternate spiral; tepals epunctate, smooth; lateral tepals 2.2–5 mm wide, the inner margins convex; pistils rectangular, green; stigma oblong, ca. 0.7 mm long; filaments retracting on drying. *Infructescence* to more than 30 cm long, probably with orange berries.

Anthurium prolatum is known from western Panama and Costa Rica (in Alajuela, Limón, Heredia, and Cartago provinces) in tropical wet forest at 350–1,000 m.

This species can be distinguished by the unusual, very long and narrow leaves, cataphylls, spadix, and spathe. It is most easily confused with *A. protensum*, differing in its spadix, which is more than twice as long as any observed for *A. protensum*; its spathe, which is considerably narrower and lacking the purple markings characteristic of *A. protensum*; and its flowers, which are twice as long as those of *A. protensum*. In addition, the much more common *A. protensum* is most frequent at about 1,800 m.

COSTA RICA. ALAJUELA: Naranjo–Aguas Zarcas, 8.5 km NE of Villa Quesada, Hwy. 15, 600 m, *Croat 46979* (MO). CARTAGO: 1.5 mi. E of Cachí, 10.2 mi. NE of junction at Paraiso, *Croat 47087* (MO). HEREDIA: Tirimbina, Sarapiquí, Istarú Farm, *Lent 2140* (F). LIMÓN: Lago Dabagri, W coast, toward Río Llei, 1,000 m, 9°38′N, 83°18′W, *Gómez et al. 23155* (B, K, MO); Río Tor Amarillo, 6 km SW of Guapiles, 400 m, *Jimenez 2113* (F). SAN JOSÉ: Parque Nacional Braulio Carrillo, entrance–Río Sucio, Estación Carrillo, 400–1,500 m, 10°5–10′N, 84°57–60′W, *Hammel & Trainer 14266* (MO). PANAMA. BOCAS DEL TORO: Fortuna–Chiriquí Grande, 550–600 m, ca. 8°48′N, 82°10′W, *McPherson 9154* (MO).

Anthurium protensum Schott, Oesterr. Bot. Z. 8: 181. 1858.

a. **Anthurium protensum** subsp. **protensum**. TYPE: Costa Rica. Heredia: Volcán Barba, 2,500–2,700 m, *Oersted 1992* (destroyed?; illustrated by Schott Aroideae 427). Figures 246–248, 260, 261.

Anthurium costaricense Engl., Bot. Jahrb. Syst. 25: 398. 1898. TYPE: Costa Rica. Cartago: above Agua Caliente, 1,800 m, *Lehmann s.n.* (holotype, B; isotype, P).

Anthurium joseanum Engl., Pflanzenr. IV 23B(Heft 21): 68. 1905. TYPE: Costa Rica. Cartago: Las Vueltas, Tucurrique, 635 m, *Tonduz 12818* (holotype, B; isotypes, P, US).

Epiphytic; stem often pendent, less than 20 cm long, 1–2 cm diam.; roots descending, brownish to green, smooth, thick and moderately elongate, 5–7 mm diam.; cataphylls subcoriaceous, narrowly lanceolate, (8)11–30 cm long, obtuse to acuminate and long-apiculate at apex, pale green, drying pale tan, persisting intact, soon dilacerating into a reticulum of fine fibers. *Leaves* spreading to pendent; petioles (6)10–35 cm long, 3–7 mm diam., subterete to bluntly angular, sometimes flattened or weakly sulcate adaxially, the surface sparsely pale-speckled; geniculum paler and slightly thicker than petiole, becoming fissured transversely with age, 1–2 cm long; blades subcoriaceous, strap-shaped to oblong-elliptic, long-acuminate at apex (the acumen weakly apiculate), acute to obtuse to narrowly rounded at base, (18)32–80 cm long, (2.5)4–11.5 cm wide, the margins undulate; upper surface matte to semiglossy, dark to medium green, lower surface semiglossy, paler to almost concolorous with the upper surface, drying greenish and matte; midrib convexly raised at base, becoming narrowly raised and then weakly sunken toward the apex above, higher than broad at base, becoming convexly raised toward the apex below, paler than surface above and below; primary lateral veins more than 15 per side, departing midrib at 40–70° angle, sunken to obscure above, flat to raised and darker than surface below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins weakly visible above and below; collective vein arising from near the base, sunken above, raised and somewhat darker than surface below, equally as prominent as primary lateral veins, 2–5 mm from margin. *Inflorescences* spreading-pendent, shorter than leaves; peduncle (13)15–49 cm long, 6–7 mm diam., 0.6–1.8× as long as petiole, pale-speckled, terete; spathe erect to reflexed, subcoriaceous, yellow-green to purple to maroon, oblong-lanceolate to lanceolate, (4.5)10–19 cm long, 1.7–4 cm wide, acuminate to long-acuminate at apex (the acumen inrolled), rounded to obtuse at base; spadix greenish to pale violet-purple to purplish gray, usually glaucous, long-tapered, prominently curved, (4)7–19 cm long, 5–9 mm diam. near base, 2–4 mm diam. near apex; flowers rhombic to 4-lobed, 2.2–2.7 mm long, 1.8–2.2 mm wide, drying 1.5–1.8 mm diam.; 4–9 flowers visible in principal spiral, 6–12 in alternate spiral; tepals densely and minutely papillate, weakly pale-punctate; pistils emergent, densely and minutely papillate, green; stigma linear, droplets appearing 2–4 days before stamens emerge; stamens emerging from the base, the laterals preceding the alternates by 30–34 spirals, the 3rd stamen preceding the 4th by 5–6 spirals, held in a tight cluster above the pistil; anthers yellow to tan, 0.5–0.6 mm long, 0.6–0.7 mm wide; thecae ellipsoid, slightly divaricate; pollen pale orange fading to white. *Infructescence* with spadix 14–32 cm long; berries orange, ovoid to oblong-ovoid, acute to beaked at apex, (6.4)8–13 mm long, (3.9)4.5–8 mm diam.; seeds 2 per berry, yellow to pale brown, oblong to semi-ovoid, flattened, (3.4)3.7–6 mm long, (1.8)2.5–4.5 mm diam., (1.2)1.6–3 mm thick, with a gelatinous, amber appendage.

This species is found in Costa Rica and Panama from 635 to 2,700 m, principally in premontane rain and lower montane rain forest life zones.

Anthurium protensum is distinguished by its cataphylls weathering to a reticulum of fibers, its elongate, narrow leaf blades with many primary lateral veins, its more or less terete petiole, the long, ovate to lanceolate spathe, pale violet-purple to lavender or greenish spadix and orange berries.

This species is closely related to *A. prolatum*, *A. brenesii*, and *A. seibertii*, all with similar, elongate leaves. See the commentary following those species for distinguishing characteristics.

Anthurium protensum comprises two subspecies. The typical subspecies occurs mostly in Costa Rica (also in western Panama), while subsp. *arcuatum* occurs only in Panama, ranging from Chiriquí to Veraguas at 1,300 to 1,750 m in premontane rainforest. The latter differs in being an erect plant with smaller leaves with fewer, more prominent, sunken veins and an acute lower midrib, an arching inflorescence with shorter, usually ovate spathe and a smaller spadix.

A third subspecies may be represented as well. Some collections have slender green spadices sometimes two or more times longer than the spathe, a generally green spathe and glabrous tepals. Examples of this entity include *Croat 60444*, *McPherson 8026* and *8685* from Bocas del Toro Province in Panama, and *Croat 36714* and *Chacon 7*, from Cartago Province in Costa Rica. More typical collections have the spadix more short-tapered, frequently tinged purple, about as long as the spathe or even shorter than the spathe, and tepals covered with a thin, waxy layer. The spathe in this latter group is usually heavily tinged purple. Examples of these plants include *Croat 44501*, *47113*, *Grayum 3867*, and *Lehmann 1756* (the type of *A. costaricensis*). Because the types of both *A. protensum* and *A. costaricensis* (considered a synonym of the former) correspond to the more commonly collected variant, the plants with the longer spadices and glabrous tepals, if they prove to be distinct, would perhaps represent a new subspecies.

COSTA RICA. WITHOUT LOCALITY: *Lehmann 1756* (B). ALAJUELA: Zapote, *Smith 1268* (NY); 11 mi. NW of Zarcero, Finca Los Ensayos, 900 m, *Croat 43533* (CM, MO); Zarcero, *Smith A692* (MO); Cordillera de Tilarán, Finca Peñas Blancas, E slope Cerros Centinelas, Monte Verde Reserve, 1,300–1,450 m, 10°18'N, 84°47'W, *Grayum 5364* (MO). ALAJUELA & PUNTARENAS: Monteverde, *Burger et al. 10792* (F); N side of Quebrada Cuecha near Sendero El Río, 1,560 m, 10°18'30"N, 84°47'50"W, *Hayworth 240* (WIS), 1,580 m, *Hayworth 222* (WIS). CARTAGO: Las Vueltas, Tucurrique, 635 m, *Tonduz 12818* (B, P, US); Moravia de Chirripó, Shiripi, 900–1,000 m, *Chacon 7* (MO); SE of Platanillo, Camino Raiz de Hule, 1,200–1,400 m, *Croat 36714* (F, DUKE, ENCB, GH, K, MEXU, MBM, MO, NY, PMA, RSA, SEL, TEX, US); Carpintera, *Brade 2513* (BR); La Cangreja, *Williams et al. 24182* (NY); NE of Pacayas, *Luteyn 3250* (DUKE); 6 km past town of Río Macho on road to Humo, Continental Divide, 1,600 m, 9°17'N, 83°45'W, *Hoover 1347* (MO); Río Grande de Orosi, suspension bridge-point opposite mouth of Quebrada Casa Blanca, Tapantí, 1,250 m, 9°46.5'N, 83°48'W, *Grayum & Jacobs 3776* (MO). GUANACASTE: La Palma, *Greenman & Greenman 5465* (MO). HEREDIA: N of Vara Blanca, *Maxon & Harvey 8304* (US), *Skutch 3706* (MICH, US); 4 mi. N of Vara Blanca, 1,350 m, *Croat 35566* (MO); San Rafael–Río San Rafael, 3 km E of Vara Blanca, 1,800 m, *Utley & Utley 4190* (MO); 1,720 m, *Rojas 513* (MO); N of Concepción, *Primack et al. 276* (DUKE); Braulio Carrillo Park, Zurquí, 1,800 m, *Gómez 20092* (MO); between Río Peje and Río Sardinal, 1,200–1,400 m, 10°15'N, 84°05'W, *Grayum & Herrera 7854* (MO); Cordillera Central, N slopes, Poas–Volcán Barba, Vara Blanca de Sarapiquí, 1,650 m, *Skutch 3652* (MICH, MO, NY); Río Pará Blanco, 1,600 m, 10°3'N, 84°1'W, *Lent 2874* (MO); Río Socorro, Sarapiquí–Cariblanco, 600–800 m, *Chacón & Herrera 1172* (MO). HEREDIA & SAN JOSÉ: Río Pará Blanco drainage, Cerro de Zurquí, 1,600–1,800 m, 10°3'N, 84°1'W, *Burger et al. 10290* (F, MO). LIMÓN: Cordillera de Talamanca, Río Tararia–NE Kámuk Páramo, Atlantic slope of Kámuk massif, 1,900–2,300 m, 9°14'N, 82°59'W, *Davidse & Herrera 29212* (MO). PUNTARENAS: SE of Santa Elena, *Almeda et al. 2031* (DUKE); headwaters of Río Bella Vista–Sitio Cotón (Cotoncito) on Río Cotón, 1,800–2,200 m, 9°49–57'N, 82°46–49'W, *Davidse et al. 25543* (MO); Monteverde, *Kennedy 605* (US), *Luteyn 3406* (DUKE); 1,500–1,550 m, *Haber 1164, 3897* (MO); Río San Luis valley, 900–1,000 m, *Haber et al. 8518* (CR); Cordillera de Tilarán, 1,550–1,720 m, *Almeda et al. 4972* (CAS, MO); Sendero El Río, Monteverde, 1,600 m, 10°18'N, 84°48'W, *Grayum & Sleeper 3867* (MO); valley of Río San Luis, just S of Monteverde, 1,000–1,200 m, 10°16'N, 84° 48'W, *Hammel & Haber 13906* (MO); Mike Fogden property, *Croat 46770* (B, MO), *Palmer 158* (NY); Santa Elena–Monteverde, 3.5 mi. from Santa Elena–Monteverde junction, near E edge of Monteverde Reserve, 1,350 m, *Croat 47113* (CM, MO); Río Barú, upper part, 201 m, *Gómez et al. 21523* (MO). SAN JOSÉ: Aserrí–Tarbaca, *Standley 41402* (US); Bajo La Hondura, *Lent 1446* (WIS), *Standley 36334* (US); 3 km N of Cascajal, 1,680 m, *Almeda & Anderson 5284* (CAS, MO); La Palma, *Luteyn 3301* (DUKE); Piedra, *Luteyn 3291* (DUKE); Parque Nacional Braulio Carrillo, Bajo La Hondura, 1,100–1,200 m, 10°4'N, 83°58'W, *Davidse et al. 23190* (MO); Río Claro–Paracito, Bajo La Hondura, 1,100–1,400 m, *Croat 44501* (MO); Santa María de Dota, 1,850 m, *Stork 1737* (MICH). PANAMA. BOCAS DEL TORO: Fortuna–Chiriquí Grande, 1.2 mi. N of Continental Divide, 5.3 mi. N of bridge over Fortuna Dam, 910 m, 8°44'N, 82°17'W, *Croat & Grayum 60444* (MO, PMA). CHIRIQUÍ: above Boquete, rd. to Bajo Mono and Alto Quiel, 1,650 m, 8°51'N, 82°29'W, *McPherson & Merello 8360* (K, MO).

b. Anthurium protensum subsp. **arcuatum** Croat, Ann. Missouri Bot. Gard. 14: 164, figs. 139 & 140. 1986. TYPE: Panama. Chiriquí: above San Félix along mining road, 25 mi. off Pan-American Highway, 1,500 m, *Croat 33138* (holotype, MO 231113; isotypes, F, K, PMA, US). Figures 249–251.

Usually epiphytic; stem less than 10 cm long, 0.7–1.8 cm diam., leaf scars 0.6 cm high, 1 cm wide; roots descending, greenish, pubescent, elongate, 3–4 mm diam.; cataphylls coriaceous, narrowly lanceolate, 3.4–7 cm long, green weakly tinged with red at margins, acute at apex, drying tan (B & K yellow 5/5), persisting intact, soon dilacerating into reticulum of fine fibers. *Leaves* spreading to pendent; petioles 10–32 cm long, 2–4 mm diam., subterete to bluntly D-shaped to quadrangular, sharply 4–5-ribbed and winged, flattened to weakly or prominently and narrowly sulcate adaxially, the margins sharply raised to winged, rounded to bluntly angular to sharply ribbed abaxially, the surface sparsely pale-speckled; geniculum slightly paler and thicker than petiole, 1–1.5 cm long; blades coriaceous to subcoriaceous, oblong to narrowly oblanceolate to narrowly elliptic or lanceolate, gradually long-acuminate at apex, obtuse to rounded at base, 19–51 cm long, 2.5–7.5 cm wide, broadest at or below middle; upper surface weakly glossy to semiglossy, dark green, lower surface semiglossy to glossy below, paler; midrib above convexly raised at base, becoming narrowly raised and eventually weakly sunken toward the apex, below acutely higher than broad at base, becoming sharply acute toward the apex, paler than surface above and below; primary lateral veins 7–12 per side, departing midrib at 45–50° angle, weakly arcuate to the collective vein, prominently to slightly sunken above, sharply to weakly raised and darker than surface below; interprimary veins scarcely visible, sunken above, raised below; tertiary veins obscure above, sometimes weakly visible below; collective vein arising from the base, sunken above, moderately sharply raised below, equally as prominent as primary lateral veins, 2–5 mm from margin. *Inflorescences* erect to spreading, shorter than leaves; peduncle 13–38 cm long, 2–4 mm diam., usually longer than petioles, 0.5–2 × as long as petioles, pale green sometimes tinged with reddish violet, terete to sharply 1-ribbed abaxially; spathe erect, curved over and hooding spadix, plain green or heavily tinged with reddish violet to reddish purple, ovate to broadly lanceolate, 4.5–14 cm long, 1.7–3.5 cm wide, broadest near the base, inserted at 70° angle on peduncle, long-acuminate to caudate at apex, obtuse to rounded or subcordate at base; stipe 5–15 mm long; spadix white to lavender (B & K purple 7/7.5) (also reported as light green becoming tan), cylindroid to weakly tapered, weakly curved, 2–9 cm long, 4–6 mm diam. near base, 3–4 mm diam. near apex; flowers rhombic to 4-lobed, (1.3)1.5–3 mm long, (1.3)1.6–2.8 mm wide, drying 1.7–1.9(2.2) mm wide; the sides jaggedly to smoothly sigmoid; 4–5 flowers visible in principal spiral, 5–8 in alternate spiral; tepals matte, minutely and densely papillate; lateral tepals 0.7–1.7 mm wide, the inner margins convex, the outer margins 2–3-sided; pistils scarcely emergent, papillate, pale green to pale violet-purple; stigma ellipsoid, 0.3–0.5 mm long, brushlike, droplets appearing briefly before stamens emerge; stamens emerging from the base, lateral stamens followed by alternates in a rapid succession, the laterals preceding the alternates by 1–2 spirals, held over and obscuring the pistil; anthers pale yellow, 0.4–0.5 mm long, 0.9–1 mm wide; thecae ellipsoid, brown, slightly divaricate; pollen pale yellow fading to creamy white. *Infructescence* pendent; spadix to 7 cm long, 2.5 cm diam.; berries bright orange, ovoid, beaked at apex, 6–9 mm long, 5–6 mm diam.; mesocarp pulpy, orange; seeds 2 per berry, creamy white, ovoid-ellipsoid, 3–3.2 mm long, 2.2–2.3 mm diam., 1.5 mm thick, enclosed in transparent, sticky envelope ca. 5 mm long, extending further beyond the apex than the base.

Anthurium protensum subsp. *arcuatum* is known principally from western Panama in premontane rainforest at 1,100–2,000 m. A single collection from Monteverde is apparently also included in this taxon even though it has not been collected elsewhere in Costa Rica.

This taxon is distinguished by its slender, short stem, more or less oblong leaf blades that are usually spreading and weakly arched, and by its usually arched inflorescence. Also characteristic is the usually lavender, greenish white or purplish violet spadix, and its ovate to broadly lanceolate, frequently purplish spathe that usually curves over and hoods the spadix.

The few cultivated collections of *Anthurium protensum* subsp. *protensum* and subsp. *arcuatum* are markedly different, but herbarium material is more difficult to separate. Subspecies *protensum* differs from subsp. *arcuatum* in having typically much larger leaf blades, rarely less than 50 cm long, with the primary lateral veins more numerous and less conspicuously sunken on the upper surface (scarcely more prominently sunken than the interprimary veins). In addition, the lower midrib is convex and the plant typically has a lanceolate spathe, a much longer, narrowly tapered spadix (usually more than 9 cm long), and an infructescence usually 20–30 cm long. Subspecies *protensum* is also usually a pendent or nearly pendent plant, whereas subsp. *arcuatum* is usually erect.

Subspecies *arcuatum* rarely has leaf blades more than 50 cm long, relatively fewer, sharply sunken primary lateral veins, an acutely raised lower midrib, a typically ovate spathe, with a spadix usually less than 5 cm long, and the infructescence less than 7 cm long.

COSTA RICA. PUNTARENAS: Monteverde Cloud Forest Reserve, along road to Peñas Blancas Valley, ca. ¼ mi. E of station, ca. 1,520 m, *Lesica & Antibus 4184* (CR, MO). PANAMA. BOCAS DEL TORO: Cerro Pate Macho, ENE of mountain, *Hammel 6254* (MO); Fortuna Road, road branching N off main Fortuna–Chiriquí Grande Hwy., 1.1 mi. from main road, 1,200 m, 8°44′N, 82°17′W, *Croat & Grayum 60295* (MO); Río Culebra, 5 km ENE of Cerro Pate Macho, 1,660 m, *Hammel 6136* (MO). CHIRIQUÍ: Boquete Region, Boquete, *Pittier 3062* (US); 9 km past divide in road to Alto Quiel from Boquete, 1,930 m, 8°49′N, 82°28′W, *Hoover 1341* (MO); Cerro Colorado, along mining road 18–27 mi. off Pan-Am Hwy., above Chamí or turnoff to Escopeta, above San Félix, 1,200–1,500 m, *Croat 33138* (F, K, MO, PMA, US); border of Chiriquí and Bocas del Toro provinces, 1,500–1,750 m, *Folsom et al. 4693* (MO); 1,170–1,250 m, 8°45′N, 82°18′W, *Croat 66839* (MO); along mining road 20 mi. above bridge over Río San Félix, near village of San Félix, 2,000 m, *Croat 48461* (MO); on upper mining road 20–28 mi. from San Félix, 1,200–1,500 m, *Croat 33369* (MO); 50 km N of San Félix on Continental Divide, 1,200–1,500 m, *Mori & Dressler 7770* (MO); along road above San Félix, 30 km above bridge over Río San Félix, 1,610–1,670 m, *Croat 37111, 37132* (MO); Cerro Horqueta, *Dwyer 8749* (DUKE), *Pittier 3160* (NY), *3161* (US); Cerro Punta, *Wilbur et al. 13081, 15235, 15236, 15252, 15377* (DUKE); Fortuna Road, Fortuna Lake–Chiriquí Grande, 4.5–5 km N of dam over Fortuna Lake, 1,100–1,135 m, *Croat & Grayum 60077* (B, CM, K, MO, PMA); trail along Continental Divide to W of Oleoducto road, Fortuna Dam, 1,200–1,500 m, 8°47′N, 82°13′W, *Churchill 5306* (MO); Río Chiriquí

Viejo, upper part, Monte Lirio, *Seibert 172* (K, NY). VERAGUAS: Santa Fe Region, Cerro Arizona, 1,330 m, *Hammel & Kress 8570* (MO); Cerro Tute, above Escuela Agrícola Alto Piedra, 800–1,450 m, *Croat 48964* (F, MO, PMA, US), *Folsom & Mauseth 8344* (MO), *Knapp & Dressler 5407* (MO), *Knapp & Kress 4353* (MO), *Sytsma & Andersson 4587* (MO).

Anthurium pseudospectabile Croat, Monogr. Syst. Bot. Missouri Bot. Gard. 14: 165. 1986. TYPE: Panama. Chiriquí: along road between Gaulaca and Fortuna Dam site, 8.3 mi. NW of Los Planes de Hornito, 8°44′N, 82°16′W, 1,260 m, *Croat 49942* (holotype, MO 2769003-005; isotypes, B, K, NY, PMA, SEL, W). Figures 252–254.

Usually epiphytic; stem ± slender, less than 30 cm long, 1.5–5 cm diam.; leaf scars 2–4 cm wide; roots few, spreading to descending, pale grayish to pale tan, occasionally greenish, somewhat pubescent, thick and elongate, tapered, 3–6 mm diam.; cataphylls coriaceous to subcoriaceous, lanceolate, stiffly erect, 19–37 cm long, acute to obtuse or ± rounded at apex, with subapical apiculum to ca. 4 mm long, light green, drying orange brown to tan, persisting intact, eventually as a reticulum of fibers. *Leaves* spreading to pendent; petioles 14–60 cm long, 7–12 mm diam., subterete to bluntly 4-sided, flattened to weakly and broadly sulcate adaxially, rounded abaxially, the surface pale-speckled; geniculum thicker and slightly paler than petiole, 1–3 cm long; blades subcoriaceous to coriaceous, oblong to oblong-elliptic, gradually acuminate at apex (the acumen weakly apiculate), decurrent to obtuse to truncate or subcordate at base, 45–150 cm long, 12–45 cm wide, broadest at or just below the middle, the margins weakly undulate; upper surface matte to semiglossy, dark green, lower surface semiglossy to glossy, slightly paler; midrib obtusely angular, becoming flat toward the apex above, prominently convex to round-raised, conspicuously paler than surface below; primary lateral veins up to 40 per side, departing midrib at 35–75° angle, straight to weakly arcuate to the collective vein, raised above in grooves, prominently raised below; interprimary veins almost as conspicuous as primary lateral veins, flat to weakly sunken above, raised below; tertiary veins obscure above, slightly darker than surface and weakly raised below; collective vein arising from near the base, sunken above, prominently raised below, equally as prominent as primary lateral veins, 2–5 mm from margin. *Inflorescences* spreading-pendent; peduncle 13–36 cm long, 5–9 mm diam., equaling up to 1.5× as long as petiole, terete to weakly quadrangular with blunt margins; spathe usually twisted or recurled, moderately coriaceous, green below, heavily tinged with purple above, lanceolate, 10–32 cm long, 2.5–7 cm wide, broadest near base, inserted at 45–60° angle on peduncle, gradually acuminate at apex, rounded to cordate at base; spadix yellowish green to green, sessile, narrowly tapered, 15–38 cm long, 8–12 mm diam. near base, 3–5 mm diam. near apex; flowers rhombic, ca. 3.5 mm long, 2.7–3 mm wide, the sides straight to weakly sigmoid; 4–7 flowers visible in principal spiral, 6–9 in alternate spiral; tepals matte, minutely papillate; lateral tepals 1.8–2 mm wide, the inner margins convex, turned up against the pistil; pistils early emergent, pale green; stigma linear, 0.6 mm long; stamens emerging ± rapidly from the base, arranged in a loose cluster around pistil; filaments ca. 0.3 mm long, ca. 0.5 mm wide; anthers white; thecae oblong, scarcely divaricate; pollen white. *Infructescence* pendent; berries orange, oblong-ellipsoid, 10–12 mm long, 5–6 mm diam.

Anthurium pseudospectabile is endemic to Panama at (590)1,000 to 1,600 m in a region that is probably premontane wet or premontane rain forest.

This species is distinguished by its pendent habit and its large, almost strap-shaped, many-veined blades with undulate margins. Also characteristic are the short-pedunculate inflorescence with a spreading, usually twisted and contorted green to purple spathe, the weakly protruding tepals, exserted stamens, early-emergent pistils, and orange berries.

Anthurium pseudospectabile is closely related to *A. spectabile*, from Costa Rica, but the latter has proportionately broader leaf blades which generally lack the undulate margins, and a petiole that is markedly quadrangular in cross section.

PANAMA. BOCAS DEL TORO: Cerro Colorado, trail along quebrada 7.5 mi. from Chamí, 1,220–1,250 m, 8°35′N, 81°45′W, *McPherson 8853* (MO); Fortuna Dam area, *Correa et al. 2664* (PMA); Oleoducto Road, Continental Divide, 1,000 m, *Churchill et al. 4647* (MO), *4648* (MO, PMA); vic. Fortuna Dam, Continental Divide, trail west of highway, 1,250 m, *McPherson 11626* (MO); Fortuna–Chiriquí Grande, 8.5 mi. N of bridge over Fortuna Lake, 4.3 km N of Continental Divide, 590 m, *Croat & Grayum 60203* (CM, MO); road branching N off main Fortuna–Chiriquí Grande Highway, Continental Divide, 1,200 m, *Croat & Grayum 60339* (CM, MO); 1.1–1.2 km N of Continental Divide, *Croat 60363* (MO, PMA, RSA), *60446* (MO). CHIRIQUÍ: Fortuna Dam area, *Hammel 2080* (MO, PMA), *Mendoza 336* (MO, PMA); 1,100–1,200 m, 8°45′N, 82°18′W, *Croat 66592* (MO), *Croat 48738* (MO); 1,200–1,600 m, *Croat 48737* (MO), *Folsom et al. 5516* (MO), *8220* (MO, PMA), *5607* (B, MO, VEN); 5.9–8.6 mi. beyond Los Planes de Hornito, 1,260–1,400 m, *Antonio 5022* (MO), *Croat 48732* (MO), *48777* (MO, US), *49851* (CM, MO), *49930* (B, K, MO, NY, SEL, W), *49942* (B, K, MO, NY, PMA, SEL), *Knapp 4962* (MO), *Knapp & Vodicka 5496* (B, MO); N of Gualaca, 22.7 mi. beyond bridge over Río Estí, 1,400 m, *Antonio 2773* (MO, PMA), *Croat 48674* (B, CAS, CM, COL, DUKE, F, K, MEXU, MO, NY, PMA, RSA, UC, US, VEN); Fortuna Lake–Chiriquí Grande, Fortuna Dam, 4.5–5 km N of dam over Fortuna Lake, 1,100–1,135, *Croat & Grayum 60072* (K, MO).

Anthurium purpureospathum Croat, Selbyana 5(3–4): 328. 1981. TYPE: Panama. Bocas del Toro: Changuinola–Almirante Railroad, Station Milla 7.5, 0–100 m, *Croat 38094* (holotype, MO 2388335; isotypes, B, BM, C, CAS, CM, CR, DUKE, F, GH, IBE, K, LE, M, MISSA, NY, P, PMA, QCA, RSA, S, SEL, US, VEN, W). Figures 263, 264.

Epiphytic, or terrestrial at higher elevations; stem ca. 2 cm diam.; roots dense, descending, brown to greenish, smooth to scurfy, moderately thick, somewhat elongate, 3–5 mm diam.; cataphylls coriaceous to subcoriaceous, narrowly lanceolate, 7–14(25) cm long, obtuse to acuminate at apex, yellowish green, weakly tinged with red, drying dark tan (B & K yellow 5/2.5), persisting semi-intact, eventually as a reticulum of fibers. *Leaves* erect to spreading; petioles 12–37(66) cm long, 4–10 mm diam., quadrangular to D-shaped, flattened to broadly and sharply sulcate adaxially, the margins raised, rounded to 1–3-ribbed abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, 1–2.5 cm long; blades subcoriaceous to moderately coriaceous, oblong-oblanceolate to oblong-elliptic, shortly acuminate at apex (the acumen apiculate), obtuse to acute or attenuate at base, 27–74(94) cm long, 7.5–40 cm wide, broadest at or above the middle, the margins broadly undulate; upper surface matte to semiglossy, dark green, lower surface glossy to weakly glossy, paler; midrib above obtusely angular-raised to convex at base, becoming narrowly raised toward the apex, below prominently higher than broad and 1-ribbed at base, gradually becoming convexly raised toward the apex, paler than surface above and below; primary lateral veins (6)11–16 per side, departing midrib at 45–70° angle, arcuate-ascending, loop-connecting in the upper half of the blade, convexly raised in grooves, paler than surface above, prominently and convexly raised and somewhat darker than surface below; interprimary veins sometimes present, almost as conspicuous as primary lateral veins; tertiary veins weakly visible above, flat to weakly raised and darker than surface below; collective vein arising from about the middle or the base of the blade, weakly sunken above, raised and darker than surface below, less prominent than primary lateral veins, 4–8(13) mm from margin. *Inflorescences* erect to spreading; peduncle 3–38(50) cm long, 6–20 mm diam., rarely shorter than, mostly equaling or slightly longer than petiole, purplish or green, subterete; spathe subcoriaceous, purple to purplish with green mottling especially near the base at the center, oblong to narrowly ovate, 4.5–17.5 cm long, 1.5–4 cm wide, broadest just above the base, acute at apex (the acumen cuspidate), obtuse to rounded at base; spadix dark violet-purple (B & K purple 2/7.5), cylindroid to slightly tapered, (4)5–22 cm long, 3–10 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic to weakly 4-lobed, 2–2.3 mm long, 2.5–3 mm wide, the sides smoothly to jaggedly sigmoid; ca. 14 flowers visible in principal spiral, ca. 7 in alternate spiral; tepals matte with small, scattered droplets; lateral tepals 1.4–1.6 mm wide, the inner margins flat against pistil; pistils slightly raised, purple becoming green and finally orange; stigma linear, ca. 0.5 mm long, droplets persisting for 4–10 days, drying with exserted papillae 4–6 days before stamens emerge; stamens emerging slowly from the base, held tightly in a circle around pistil; filaments transparent, flattened, soon retracting, holding anthers at level of tepals, 0.7–1 mm long, ca. 0.7 mm wide; anthers pale orange; thecae ellipsoid, usually not divaricate; pollen golden yellow (B & K yellow 8/2.5) fading to creamy white. *Infructescence* erect to spreading; spathe usually persisting; spadix 9–19 cm long, to 4 cm diam.; berries orange, red-orange to red (B & K red 6/7.5), narrowly ovoid, acute with minute, mammilliform style at apex, to 10 mm long; mesocarp pasty, transparent; seeds 1 or 2 per berry, pale greenish yellow, ca. 4 mm long, 2 mm diam.

This species is known only from Panama and occurs principally from near sea level to 1,500 m in Bocas del Toro and Chiriquí provinces in wetter parts of tropical moist and premontane wet forest. A collection from San Blas (*de Nevers 4207*) is out of range, but does not differ significantly from other collections from western Panama.

Anthurium purpureospathum is distinguished by its rosulate habit, large, thin, semi-intact cataphylls, more or less oblanceolate leaf blades, almost quadrangular petioles which are often three-ribbed abaxially, its generally short peduncles, usually violet-purple, reflexed spathe, usually short violet purple spadix, early-emergent pistils, and by its long, sharply pointed, orange to red-orange berries.

This species is most closely related to *A. upalaense*, which differs in having leaves with the collective vein arising from above the middle of the blade, a generally longer peduncle, and a more long-tapered spadix.

An odd collection is *McPherson 8572*, because of its very large size. This collection counts for the parenthetical measurements for cataphyll, petiole, blade, and peduncle lengths in the description.

PANAMA. BOCAS DEL TORO: 15 km S of Changuinola, 300–500 m, *Antonio 3148* (MO); Ojo del Agua, 7 km W of Almirante, 190–220 m, *Croat 38179, 38180* (MO); Milla 7.5, hill above station, 30 m, *Croat & Porter 16416* (MO); 100 m, *Croat 38094* (B, BM, C, CAS, CM, CR, DUKE, F, GH, IBE, K, LE, M, MISSA, MO, NY, P, PMA, QCA, RSA, S, SEL, US, VEN, W); 10 mi. NW of Almirante, 0–100 m, *D'Arcy 11207* (MO); Almirante–Ojo del Agua, 3–6 km W of Almirante, 30–200 m, *Croat 38214* (MO, PMA); Chiriquí Lagoon, Shepherd Island, *von Wedel 2721* (GH, MO); Fortuna Road, Chiriquí Grande–Fortuna, 13.2 mi. W of Chiriquí Grande, 310 m, *Croat & Grayum 60145* (B, MO); 10 mi. from Continental Divide, 120 m, 8°55'N, 82°10'W, *McPherson 8572* (MO); 175 m, *Croat 66820* (MO); Isla Bastimentos, 1–2 km N of Trouble Hole, 30–100 m, *Peterson & Annable 6855* (US); Isla Colón, 0–120 m, *von Wedel 125* (MO), *569* (GH, MO); Río Changuinola, 1 mi. S of Changuinola, *Lazor & Tyson 2661* (MO); Río Cricamola, Finca St. Louis–Konkintoe, 10–50 m, *Woodson et al. 1889* (MO, NY); Río Guarumo, 5 mi. S of Chiriquicito, *Lewis et al. 1985* (MO, NY); Water Valley, *von Wedel 708* (MO), *774* (GH, MO). CHIRIQUÍ: Cerro Colorado, along mining road 24 mi. above bridge over Río San Félix, N of village San Félix, 1,430–1,500 m, *Croat 48483* (MO); along mining road 18–27 mi. off of Pan-Am Hwy., above Chamí or turnoff to Escopeta, above San Félix, 1,200–1,500 m, *Croat 33139* (CM, MO, NY); Bocas Road, 1,500 m, *Folsom & Collins 1835* (MO); 28 mi. above San Félix, 9–10 mi. above turnoff to Escopeta, 1,200–1,500 m, *Croat 33257* (MO, PMA); Fortuna Road, Chiriquí Grande–Fortuna, 7.7 mi. W of Chiriquí Grande, 1.5 mi. W of Punta Peña, 80 m, *Croat & Grayum 60090* (MO). SAN BLAS: El Llano–Cartí Road, Nusgandí, 19.1 km from Interamerican Hwy., 350 m, *de Nevers 4207* (MO).

Anthurium ranchoanum Engl., Bot. Jahrb. Syst. 25: 421. 1898. TYPE: Costa Rica. Heredia: Rancho Flores in territorio Bacha, Volcán Barba, 2,100 m, *Pittier 2295* (holotype, B; isotypes, BR, G). Figures 262, 265, 266.

Anthurium valerii Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 137. 1937. TYPE: Costa Rica. Heredia: Vara Blanca, *Valerio 1600* (holotype, F).

Anthurium vinicolor Standley & L. O. Williams, Ceiba 3: 106. 1952. TYPE: Costa Rica. San José: Cordillera de Talamanca near Copey, 1,800 m, *L. O. Williams 16538* (holotype, EAP; isotypes, F, US).

Epiphytic or terrestrial; stem to 100 cm long, ca. 1.5–2 cm diam.; leaf scars occasionally conspicuous, 0.7–1 cm high, 1.5–1.7 cm wide; roots moderately numerous, descending, greenish, pubescent, sometimes smooth, moderately thick and elongate, blunt, 3–7 mm diam.; cataphylls subcoriaceous, 6–30 cm long, subrounded at apex with subapical apiculum, green tinged with red, drying tan (B & K yellow-red 9/2.5), persisting semi-intact, eventually deciduous. *Leaves* spreading; petioles 11–150 cm long, 5–15 mm diam., erect-spreading, subterete to nearly D-shaped, shallowly and narrowly sulcate to flattened adaxially, rounded abaxially, the surface faintly pale-speckled; geniculum slightly thicker and paler than petiole, 1.5–3 cm long; blades moderately coriaceous, somewhat pliable, narrowly ovate to ovate-deltoid to ovate-triangular, acuminate at apex (the acumen apiculate), shallowly or deeply lobed at base, 17–64 cm long, 9–34 cm wide, broadest between the base and middle, the margins undulate; anterior lobe 12–29 cm long, the posterior lobes 7–13 cm long; sinus arcuate to parabolic; both surfaces semiglossy to glossy, medium to dark green above, much paler below; midrib bluntly angular to convexly raised above (rarely acutely angular), much paler than surface, round-raised at base, becoming prominently and convexly raised toward the apex, paler than surface below; basal veins 3–6 pairs, 1st usually free to base, 3rd to 6th coalesced 1–2 cm, 4th to 6th coalesced 3.5–6 cm, raised above and below; posterior rib naked, turned up on outer margin; primary lateral veins 4–9 per side, departing midrib at 40–50° angle, broadly arcuate, weakly raised above and below, more so below; interprimary veins flat above, weakly raised below, less conspicuous than primary lateral veins; tertiary veins weakly visible above and below; collective vein arising from one of the primary lateral veins, sometimes from the first basal vein, raised to weakly sunken above, raised below, 2–10 mm from margin. *Inflorescences* erect to erect-spreading, much shorter than leaves; peduncle 13–100 cm long, 5 mm diam., 0.6–0.7 × as long as petiole, green to purplish, terete; spathe spreading, hooded over the spadix, recurled at apex, subcoriaceous, green to green tinged with purple to purple or maroon, lanceolate to narrowly ovate, 4–35 cm long, 2–6.5 cm wide, broadest near the base, acute and apiculate at apex (the acumen tightly inrolled), truncate at base; stipe 1.6 cm long in front, 1.3 cm long in back; spadix pink to red to dark violet-purple to maroon, weakly tapered, 3.5–19 cm long, 9–15 mm diam. near base, 6–9 mm diam. near apex; flowers rhombic, 2–3.2 mm long, 2.6–

3(5) mm wide, the sides jaggedly sigmoid; 5–10 flowers visible in principal spiral, 7–20 in alternate spiral; tepals matte, sparsely punctate, moderately papillate; lateral tepals 1–1.8 mm wide, difficult to discern, the inner margins broadly rounded, the outer margins 3–4-sided; pistils not emergent, pale green; stigma slitlike, ca. 0.5 mm long; stamens emerging promptly throughout in a scattered pattern, becoming prominently exserted, lateral stamens emerging almost to apex before alternates emerge, surmounting tepals; filaments fleshy, somewhat flattened, translucent, ca. 0.5 mm long, ca. 1 mm wide; anthers creamy white to pale orange, ca. 0.6 mm long, 0.7 mm wide; thecae ovoid-ellipsoid, slightly divaricate; pollen yellow to yellow-orange, fading to white, yeasty-scented. *Infructescence* arching-pendent; spathe persisting; spadix to 50 cm long, to 3 cm diam.; berries orange, narrowly obovoid, acute at apex, 12–14 mm long, 6 mm diam.; mesocarp bitter; seeds 1–2 per berry.

Anthurium ranchoanum is found in Costa Rica and Panama at 500 to 2,300 m (usually above 1,000 m), usually in tropical wet, premontane rain and lower montane rain forest life zones.

This species is an atypical member of sect. *Pachyneurium*, recognized by its obtusely sulcate petioles and thick, ovate to ovate-triangular blades with heavy, rather numerous veins. Particularly characteristic is the ovate to lanceolate, hooded spathe which is green tinged with purple and remains stiffly erect. Other distinguishing features include the dark violet-purple, relatively stubby, scarcely tapered, somewhat pendent spadix with tight clusters of white stamens, and the orange berries.

Anthurium ranchoanum is most closely related to *A. cotobrusii*, which differs in having an erect, non-hooding spathe and a markedly tapered spadix which is 10–20× (vs. less than 6×) longer than thick.

Two collections worthy of mention are *Grayum & Dickie 6587* and *6590* which differ from typical collections in having blades drying thinner with less conspicuous tertiary veins, an acute midrib on upper surface and proportionally longer spadix at anthesis. They are perhaps subspecifically distinct.

COSTA RICA. ALAJUELA: Río La Paz Grande, 7.5 km N of Vara Blanca, 1,270–1,350 m, *Croat 36052* (MO); Sucre–Laguna Pozo Verde, toward Cerro Porvenir, 2,000 m, *Luteyn et al. 4502* (MO). CARTAGO: Copé, *Williams & Allen 16538* (US); ridge N of Continental Divide, E of Quebrada Siberia, ca. 2 km E of Villa Mills, *Grayum & Dickie 6587* (CM, CR, MO), *6590* (CR, MO). HEREDIA: Vara Blanca–Puerto Viejo, 5.5 km N of Vara Blanca, 1,200 m, *Croat 36053* (MO); headwaters of Río Santo Domingo, 3 km NE of San Rafael de Vara Blanca, N slope Volcán Barva, 2,060 m, 10°1.5′N, 84°07′W, *Grayum 7226* (MO); 1 km NE of Los Cartagos, 2,100 m, *Lent 1898* (MO); Cerro Chompipe–SW flank of Volcán Barva, N of Hwy. 113 connecting with Calle Gallito, 2,000–2,100 m, 10°7′N, 84°5′W, *Baker et al. 239* (MO); Monte Cristo, 1,720 m, *Rojas 511* (MO); slopes of Volcán Barva, above San Rafael and Uvita, along Río Segundo, 1,900–2,000, 10°05′N, 84°05′W, *Berringer & Schatz 2039* (MO); Parque Nacional Braulio Carrillo, San Rafael de Vara-Blanca, 1,830 m, 10°11′50″N, 84°6′35″W, *Herrera 242* (MO), *244* (MO); 1,800 m, *266* (MO); 2,000 m, *228* (MO); NNW of Heredia, *Lellinger & White 981, 1012* (US); road to Sacramento, *Utley & Utley 4564* (DUKE); San Isidro, *Pittier 14058* (US), *Standley & Valerio 50243, 50798, 51455, 51620, 52345* (US); N of San Rafael, *Lems s.n.* (K, NY); Braulio Carrillo Park, Zurquí, 1,700–2,000 m, *Gomez 20103, 20221* (CR, MO), *20225* (B, CR, F, K, MO); Cerro Caricias and Cerro Zurquí, S slopes, bordering Quebrada Caricias, NE of Heredia, 1,600–1,800 m, *Luteyn 3275* (MO); Cerro Chompipe, *Luteyn & Wilbur 4422* (DUKE); N slope, San Rafael–Río Las Vueltas, 2,100–2,200 m, 10°5′N, 84°4′W, *Stevens 13980* (MO); Río Vueltas, upper Río Patria, E slopes of Volcán Barva, Continental Divide, 2,000 m, 10°6′N, 84°4′W, *Burger & Liesner 6369* (MO); Volcan Barva, *Pittier 2295* (BR), *Skutch 3657* (MICH, US). PUNTARENAS: Cantón de Coto Brus, cultivated at Las Cruces Tropical Botanical Garden, 1,200 m, *Croat 44443, 57242* (MO); Monteverde, Río Guacimal, below Lechería, 1,500 m, 10°17′N, 84°48′W, *Hammel & Trainer 13816* (MO); near E edge of Monteverde Reserve, 1,350 m, *Croat 47130* (MO); 1,450 m, *Haber 4071, 4086, 4087* (MO); Río San Luis, 1,000 m, *Haber et al. 4975, 5016* (MO). SAN JOSÉ: N of San Isidro del General, *Utley 407* (DUKE); 5 km SW of Empalme on road to Santa María de Dota, 2,000 m, *Antonio 721* (MO); S of Santa María de Dota, *Luteyn 3324* (DUKE), *Standley 41767* (US), *Standley & Valerio 44077* (US); Santa Rosa del Copey, *Tonduz 12266, 12267, 12269* (US); Rio Cascajal, 3 km NE of Cascajal, 1,680 m, *Lent 2181* (MO). PANAMA. BOCAS DEL TORO: Cerro Colorado, along road between Río San Felix and mining exploration camp, 7 mi. W of Chamí, along trail through Guaymi village, 1,500 m, *Croat 69211* (MO); Cerro Pate Macho, NW ridge, from summit to Finca Serrano, 1,200–2,100 m, *Sytsma et al. 4949* (MO). BOCAS DEL TORO & CHIRIQUÍ: ridge of Continental Divide, NE of Cerro Pate Alto, 2,200 m, 8°47′N, 82°21′W, *Knapp & Schmalzel 4755* (MO). CHIRIQUÍ: Cerro Horqueta, Cordillera de Talamanca, above Boquete, 1,860–1,940 m, 8°49′N, 82°29′W, *Cochrane et al. 6264* (MO); NW of Boquete, 1,660–1,930 m, *Herrera 545* (MO); Cerro Hornito, 1,400–1,750 m, *Folsom et al. 7224* (MO); 1,750–1,900 m, 8°41′N, 82°10′W *Croat 67985* (MO); Cerro Hornito summit, above Los Planes de Hornito, 2,100–2,230 m, *Hammel 6217* (MO), *Knapp et al. 4202* (MO); Cerro Horqueta, *Dwyer et al. 545* (GH, MO, US); Cerro Pando, E slopes, 2,000–2,300 m, 8°55′N, 82°44′W, *Knapp 1653* (K, MO); Cerro Pate Macho, Continental Divide, NE of Cerro Pate Macho, Bocas del Toro border, above Palo Alto, 2,200 m, 8°47′N, 82°21′W, *Knapp et al. 4240* (MO); along Continental Divide, NE of Boquete, 1,800–2,200 m, *Croat 48519A* (CM, MO), *Croat 48553* (MO), *Croat 66407* (MO); Cerro Punta, 2.7 mi. NW of Río Chiriquí Viejo, Las Nubes, 2,200 m, *Liesner 326* (MO, PMA); Fortuna Road, 1,300 m, *McPherson 8779* (B, MO, NY, PMA); Fortuna Dam, ridge 7 mi. N of Los Planes de Hornito, 1,000 m, *Knapp et al. 4177* (MO); Gualaca–Fortuna Dam, 5.9 mi. NW of Los Planes de Hornito, 1,370 m, *Croat 49846* (MO); Fortuna Dam, 1,200–1,400 m, *Hammel 2113* (MO); Río Palo Alto headwaters, 0.5 km E of Cerro Pate Macho, 1,800–2,100 m, 8°47'N, 82°21'W, *Knapp et al. 2120* (MO); Dtto. Bugaba, Cerro Pando, Santa Clara, 8°50'N, 82°44'W, *van der Werff & Herrera 7275* (MO, PMA, RSA).

Anthurium reflexinervium Croat, sp. nov. TYPE: Peru. Huánuco: Prov. Leoncio Prado, Dtto. Rupa Rupa, Tingo María, vic. of airport, 750–800 m, *Plowman & Ramírez 7585* (holotype, MO 2743714; isotypes, F, K, NY, SEL). Figures 267, 268, 271.

Planta epilithica; internodia brevia, 1–3 cm diam.; cataphyllum late lanceolato-trigonum; petiolus 3–8 cm longus, (4)6–12 mm diam., trigonus, aliquando D-formatus; lamina late oblanceolato-elliptica, 41–72 cm longa, (10.5)13–18 cm lata; nervis primariis lateralibus 23–26(35) utroque, manifeste retrorse arcuati; pedunculus 18–40 cm longus, 3–6 mm diam.; spatha lanceolato-ovata aut oblongo-lanceolata aut oblongo-elliptica, 4.5–9 cm longa, 0.7–2.1 cm lata; stipes ad 5 mm liber; spadix contractus, 6–11 cm longus, basi 5–9 mm diam., apice 2–5 mm diam., rubellus-violaceus ad atrorubellum-purpureum. Baccae rubro-violaceae, 8 mm longae.

Epilithic; stem usually less than 15 cm long, 1–3 cm diam.; leaf scars 0.7 cm high, 1 cm wide; roots dense, ascending to descending, brown, smooth to tomentose, weakly tapered, 3–4 cm long, 3–5 mm diam.; cataphylls subcoriaceous, broadly lanceolate-triangular, (2)4–4.5 cm long, acute at apex, drying dull brown, persisting semi-intact, quickly dilacerating and persisting as fine linear fibers, splitting at apex. *Leaves* erect to spreading; petioles 3–8 cm long, (4)6–12 mm diam., broadly and sharply triangular, sometimes sharply D-shaped, flattened, sometimes with a medial rib adaxially, the margins winged and undulate, prominently and sharply angular to rounded abaxially; geniculum scarcely to moderately thicker than petiole, 0.5–1 cm long; sheath 2–3.5 cm long; blades coriaceous to subcoriaceous, broadly oblanceolate-elliptic, acute at apex, obtuse to shallowly cordate at base, 41–72 cm long, (10.5)13–18 cm wide, broadest at or above the middle, the margins sometimes concave toward the base, moderately to strongly undulate; upper surface matte to semiglossy, dark green, lower surface semiglossy, paler; both surfaces strongly bullate and quilted; midrib flat and with a sharp rib at base, becoming acutely raised and higher than broad toward the apex above, acutely raised, higher than broad and 1-ribbed to winged below; primary lateral veins 22–26(35) per side, departing midrib at acute to obtuse angle, spreading retrorsely at 30–70° angle, conspicuously arcuate to the collective vein, narrowly raised in deep grooves above, less so below, knife-edge-like when dried below, less so above; interprimary veins few, almost as conspicuous as primary lateral veins; tertiary veins weakly raised to flat below, weakly visible above and below when dried; reticulate veins obscure to conspicuous when dried, flat; collective vein arising from near the apex, about the middle of the blade or near the base, equally as prominent as major tertiary veins, 2–5 mm from margin. *Inflorescences* erect; peduncle 15–40 cm long, 3–7 mm diam., 2.8–8(11)× as long as petiole, olive-green to dark green, terete with a diminishing rib, firm; spathe ascending to reflexed, sometimes recurled, subcoriaceous to coriaceous, olive-green to pale olive-green, tinged with red to uniformly dark green, lanceolate-ovate to oblong-lanceolate to oblong-elliptic, 4.5–9 cm long, 0.7–2.4 cm wide, broadest near the base, inserted at 45–80° angle on peduncle, abruptly acuminate at apex (the acumen tightly inrolled and cuspidate, 2–3 mm long), narrowly acute to obtuse to rounded at base, the margins meeting at 80° angle; stipe ca. 6–13(20) mm long in front, 1–6 mm long in back; spadix red-violet to dark red-purple (B & K purple 4/7.5), tapered, erect, somewhat curved, 6–11 cm long, 5–10 mm diam. near base, 2–5 mm diam. near apex, broadest at the base; flowers ± square, 2.0–2.5 mm long when fresh, drying 1.9–2.4 mm long, 2.5–3.7 mm wide when fresh, drying 1.7–1.9 mm wide, the sides straight to smoothly or jaggedly sigmoid; 5–9 flowers visible in principal spiral, 4–14 in alternate spiral; tepals densely and minutely papillate; lateral tepals 1.1–2 mm wide, the inner margins ± straight to broadly convex, weakly erose, the outer margins 2–3-sided; pistils weakly raised, greenish, somewhat papillate; stigma slitlike, becoming broadly ellipsoid to nearly circular, 0.4–0.5 mm long, depressed medially with the margins somewhat raised when fresh, drying slightly sunken and blackish; stamens emerging rapidly in a complete sequence, the laterals preceding the alternates by 6–14 spirals, 3rd preceding 4th by 1–2 spirals, held at the sides of the pistil; anthers yellow, 0.5–0.9 mm long, 0.7–1.0 mm wide; thecae ovoid-ellipsoid, not divaricate. *Infructescence* with spathe green, persisting; berries reddish violet, 8 mm long.

Anthurium reflexinervium is known only from the vicinity of Tingo María in Huánuco, Peru, at 650 to 800 m, on rocky slopes near the Río Huallaga, in a premontane tropical moist–tropical moist forest transitional life zone.

This species is easily recognized by its strongly quilted-bullate leaf blades with numerous, prominently retrorse, arcuate primary lateral veins (hence the name). Prominently retrorse primary lateral veins are otherwise found only in *A. latissimum* and *A. paraguayense* var. *coroicoanum*, but these lack strongly bullate leaf blades and have retrorse veins only toward the base. Other species may occasionally have a few retrorse primary lateral veins near the base.

Anthurium reflexinervium is a stunning horticultural subject, at present cultivated at several botanical gardens and in a few private collections.

PERU. HUÁNUCO: Tingo María Region, Tingo María–Monzón, Río Patay Rondos, Cuevas de Guácharo, 650 m, 9°21'S, 76°12'W, *Croat 57949* (BM, CAS, CM, MO, NY, RSA, SEL, U, US, USM); Río Huallaga, *Croat 21080* (MO); Prov. Leoncio Prado, Río Huallaga, near airport, 700–800 m, *Plowman 5823A* (GH); Prov. Leoncio Prado, Dtto. Rupa Rupa, Tingo María, 750–800 m, *Plowman & Ramírez 7585* (F, K, MO, NY, SEL).

Anthurium remotigeniculatum Croat, sp. nov. TYPE: Peru. San Martín: along road between Tarapoto and Yurimaguas, 530 m, *Croat 58114* (holotype, MO 3183169; isotypes, B, GH, K, M, NY, QCA, RSA, SEL, US, USM). Figures 272, 275.

Planta terrestris, aliquando epilithica; internodia brevia, 1.5–6 cm diam.; cataphyllum anguste trigonum; petiolus 10–34 cm longus, 5–10 mm diam., D-formatus; geniculum ad 16 cm remotum; lamina ovata ad obovata vel late elliptica, (20)27–100 cm longa, (9)14–28.5 cm lata; nervis primariis lateralibus 6–8 utroque; pedunculus 63.5–96 cm longus, 7–17 mm diam.; spatha linearis-lanceolata, 10.5–12 cm longa, 0.5–1.5 cm lata, viridis; stipes usque ad 4 mm liber; spadix longus et graduatim contractus, 10.5–25 cm longus, basi 6–7 mm diam., apice 3–4 mm diam., atroviolaceo-purpureus; baccae rubello-purpureae, ca. 5.8–6 mm longae, 2.8–3.7 mm diam.

Terrestrial, occasionally epilithic; stem short, 1.5–6 cm diam.; roots few, descending, greenish to brown, smooth to densely pubescent, elongate, 4–6 mm diam.; cataphylls coriaceous to subcoriaceous, narrowly triangular to broadly lanceolate, unribbed, 3–7.5 cm long, acute at apex, reddish purple, drying brown (B & K yellow 3/2.5), persisting intact, eventually deciduous. *Leaves* erect to erect-spreading; petioles 10–34 cm long, 5–10 mm diam., D-shaped, narrowly and obtusely sulcate adaxially with the margins blunt, not raised, rounded abaxially, the surface pale-speckled; geniculum thicker, slightly paler than, and more shallowly sulcate than petiole, becoming fissured transversely with age, 1.5–2 cm long, remote from the base of the blade ca. 2–16 cm, rarely contiguous; blades coriaceous, ovate to obovate to broadly elliptic, abruptly acuminate, sometimes acute at apex (the acumen weakly apiculate and downturned), long-attenuate at base, (20)27–100 cm long, (9)14–28.5 cm wide, broadest at or above the middle, the margins weakly to prominently undulate; upper surface matte to weakly glossy, medium to dark green, lower surface matte, conspicuously to moderately paler, appearing minutely pale-speckled and with translucent, alveolate pattern on high magnification when fresh; both surfaces drying yellowish to yellowish green; midrib above flat to convexly raised at base, becoming more convex toward the apex and paler than surface, below prominently higher than broad at base, becoming convexly raised toward the apex and slightly paler than surface; primary lateral veins 6–8 per side, departing midrib at 30–60° angle, straight near the midrib, becoming arcuate-ascending near the margin, weakly convexly raised and scarcely paler than surface above, prominently raised below, drying prominently raised above and below; interprimary veins weakly visible and sunken above, slightly darker than surface, scarcely raised below; tertiary veins sunken above, weakly raised and darker than surface below; collective vein arising from about the middle of the blade or in the upper third, slightly sunken above, raised and darker than surface below, 5–15 mm from margin. *Inflorescences* erect to spreading, equaling or longer than leaves; peduncle 63.5–96 cm long, 7–17 mm diam., 2–4× as long as petiole, green to green heavily tinged with purple; spathe spreading-recurled, coriaceous to subcoriaceous, plain green or heavily to slightly tinged with purple, linear-lanceolate, 10.5–13.5 cm long, 0.5–3 cm wide, broadest near base, acute at apex (the acumen inrolled), acute to decurrent at base; stipe 1.3–2.5 cm long in front, to 4 mm long in back; spadix maroon to dark violet-purple (B & K purple 2/2.5), long-tapered, curved, 10.2–25 cm long, 6–8 mm diam. near base, 3–4 mm diam. near apex; flowers ± square, 1.8–2.5 mm in both directions, the sides straight to smoothly sigmoid; 4–8 flowers visible in principal spiral, 7–13 in alternate spiral; tepals matte, densely and minutely papillate, scarcely punctate; lateral tepals 0.9–1.8 mm wide, the inner margins convex, the outer margins irregularly 2–3-sided; pistils emergent, densely and minutely papillate, reddish purple, becoming green; stigma linear, slitlike, 0.5–0.7 mm long; the lateral stamens preceding the alternates by 3–4 spirals, the 3rd stamen preceding the 4th by 3–5 spirals, held in a tight cluster above the pistil; anthers yellow, 0.4–0.6 mm long, 0.8–1 mm wide, scarcely exserted; thecae ovoid, slightly or not divaricate; pollen yellow fading to white. *Infructescence* with spathe absent; spadix at least 13 cm long, 1.5 cm diam.; berries obovoid, reddish purple, white at base, rounded at apex (truncate when dried), ca. 6.5–7.5 mm long, 5–6 mm diam., mesocarp juicy, translucent; seeds 2, 4.5–5.0 mm long, 2.5 mm diam., scarcely flattened, reddish purple, minutely pale-speckled.

Anthurium remotigeniculatum is recorded only from Peru, where it occurs in the provinces of San Martín and Amazonas at 530 to 1,160 m, in tropical moist and tropical premontane wet forest life zones.

This species is characterized by its terrestrial habit, short cataphylls that remain semi-intact, D-shaped petioles which are obtusely and bluntly sulcate adaxially, and its elongate, long-tapered, dark purple spadix. Especially significant is the leaf blade base, which is long-attenuate (especially in older plants) and eventually naked, making the geniculum seem remote sometimes for as much as 16 cm from the base of the blade, hence the specific epithet. Also characteristic are the coriaceous leaf blades which are ovate, obovate, or broadly elliptic, dark green above and conspicuously paler below, appearing speckled and with a translucent, alveolate pattern under high magnification on fresh plants.

Anthurium remotigeniculatum is most closely allied to *A. pachylaminum*, which differs in having more coriaceous leaf blades lacking the remote geniculum.

Although most of the specimens of *A. remotigeniculatum* display the remote geniculum characteristic very clearly, there are some exceptions. Specimens lacking this feature otherwise show remarkable similarity to more typical material. Observations on living material show that the same plant may produce the characteristic leaves with a remote geniculum and "normal" leaves at the same time, and such aberrant specimens have thus been included in the species concept.

PERU. AMAZONAS: Prov. Bagua, 15.6 km E of main plaza in Bagua, 5 km above La Peca, 1,051–1,160 m, 5°33'S, 78°21'W, *Croat 58360* (B, BM, F, GH, K, M, MBM, MO, NY, P, QCA, SEL, US, USM, W). SAN MARTÍN: Tarapoto–Yurimaguas, 1,200 m, cultivated at SEL (#81-2283) (MO); Dtto. Tarapoto, Tarapoto–Yurimaguas, Km 13, 750–1,000 m, *Rimachi 5781* (IBE); Km 12–13.5, 700 m, *Rimachi 5173* (IBE); Río Huallaga, Tarapoto–Yurimaguas, 530 m, 6°30'S, 76°21'W, *Croat 58114* (B, K, GH, M, MO, NY, QCA, RSA, SEL, TEX, US, USM).

Anthurium salvadorense Croat, Selbyana 5(3–4): 333. 1981. TYPE: El Salvador. Ahuachapán: 1.5 mi. SW of Tacuba on road to San Francisco Menéndez, riverbank of Río Chokama, 700 m, *Croat 42169* (holotype, MO 2583750; isotypes, CAS, F, ITIC, K, LE, M, MEXU, RSA, SEL, TEX, US). Figures 269, 273.

Terrestrial or epilithic; stem short, 2–5 cm diam.; roots numerous, dense, descending to spreading or ascending, pale green to tinged reddish, smooth to pubescent, short and moderately thick, bluntly pointed at apex, 4–10 mm diam.; cataphylls moderately coriaceous, shortly lanceolate, 5–12.5 cm long, pale yellowish green, acute and apiculate at apex, drying light to dark brown, persisting partially intact, eventually deciduous. *Leaves* erect to spreading; petioles 9.5–46 cm long, (4)6–10 mm diam., ± quadrangular to D-shaped, broadly and shallowly to deeply sulcate, sometimes with medial rib adaxially, the margins blunt to sharp and raised, rounded to multi-ribbed abaxially, the surface pale-speckled; geniculum thicker than petiole and paler than petiole, 1–2 cm long; blades subcoriaceous, elliptic to broadly elliptic to oblanceolate, gradually to abruptly acuminate at apex (the acumen downturned, ca. 15 mm long), acute to obtuse to narrowly rounded at base, 25–65 cm long, 8–26 cm wide, broadest at or above middle, the margins undulate; upper surface matte to semiglossy, lower surface matte; medium green above, slightly paler below; midrib above flat with weak medial ridge at base, becoming obtusely angular and eventually sunken toward apex, below higher than broad, 1–4-ribbed at base, becoming prominently and convexly raised or convexly raised with a rib toward the apex and slightly paler than surface; primary lateral veins 7–14 per side, departing midrib at 45–60° angle, straight, loop-connected in the upper half, convexly raised above and below, slightly paler than surface; interprimary veins few, raised above and below; tertiary veins sunken to flat above, raised below; collective vein arising from about the middle of the blade or higher, sunken above, raised below, 5–12 mm from margin. *Inflorescences* erect to spreading; peduncle 13–57 cm long, 3–7 mm diam., 1.4–2.8× as long as petiole, light green, terete, weakly multi-ribbed; spathe erect to spreading, becoming recurled, moderately coriaceous, pale yellow-green (B & K yellow-green 8/10), ovate-lanceolate to oblong-lanceolate, 4.5–10 cm long, 1–4.3 cm wide, broadest just above the base, inserted at 155–170° angle on peduncle, acuminate at apex (the acumen apiculate and inrolled), subcordate and decurrent on peduncle at base; spadix pale green (B & K green 8/5), sessile, cylindroid to weakly tapered, somewhat curved, 2.5–11 cm long, 7–12 mm diam. near base, 4–7 mm diam. near apex; flowers ± irregularly 4-lobed, 2–3.3 mm long, 2.5–3.6 mm wide, the sides prominently jaggedly sigmoid; 6–8(10) flowers visible in principal spiral, 9–12 in alternate spiral; tepals smooth, matte; lateral tepals 1.4–1.7 mm wide, the inner margins rounded, somewhat erose, sometimes turned up against pistil, the outer margins irregularly 2–4-sided; pistils weakly emergent, prominently raised before stamens emerge, dark green; stigma circular to ellipsoid, 0.3–0.4 mm long, erect and brushlike, droplets appearing 2–4 days before stamens emerge, stamens emerging rapidly in a complete sequence from the base, lateral stamens almost to apex before stamens emerge; anthers pale green, 0.8–1.2 mm long, 0.7–1.3 mm wide, contiguous, inclined over pistil; thecae weakly divaricate; pollen pale yellow, soon fading to white, sweetly fruit-scented. *Infructescence* spreading; spathe persisting and erect; spadix 6.5–10.5 cm long, ca. 2 cm diam.; berries orange-red (B & K yellow-red 5/2.5 to red 4/10), broadly obovoid, rounded to flat or weakly indented at apex, 5.5–9 mm long, 4–9 mm diam.; pericarp moderately thickened, with numerous punctiform raphide cells especially in the apical half; mesocarp pulpy or mealy, with numerous raphide cells; seeds 1 or 2, yellowish white to tan, obovoid to broadly obovoid, 6–6.5 mm long, 5–5.8 mm diam., 3 mm thick, densely covered with punctiform raphide cells.

Anthurium salvadorense is known only from El Salvador and Guatemala at 500 to 800 m. It was first collected by Sixto Alberto Padilla in 1922 in the Department of Ahuacapán in El Salvador. The species was later collected by Paul C. Standley in the adjacent Department of Jutiapa in Guatemala.

This species is a typical member of the section, and earlier collections were confused with *A. schlechtendalii*, to which it is related. *Anthurium salvadorense* differs in being a usually well-rooted plant with fewer, very large fleshy roots and a usually almost elliptic blade, but especially by its inflorescence, which has a pale green, ovate-lanceolate spathe that is weakly convolute at the base and erect, enshrouding the usually short, pale green spadix. *Anthurium schlechtendalii* differs in having usually oblanceolate blades, a coriaceous, more lanceolate, prominently reflexed, usually purplish spathe, and a more elongate, purplish spadix.

EL SALVADOR. AHUACHAPÁN: San Francisco Menéndez–Tacuba, El Imposible, 500 m, *Bernhardt s.n.* (MO), *Croat 42092* (B, BM, MO, RSA, U, W); Río Chokama, 1.5 mi. S of Tacuba, 700 m, *Croat 42169* (CAS, F, ITIC, K, LE, M, MEXU, MO, RSA, SEL, TEX, US). GUATEMALA. JUTIAPA: Jutiapa, *Standley 76313* (F, US); SW of San Cristóbal, *Dunn et al. 23222* (UMO); Monjoy Canyon, 8 mi. W of San Cristóbal, 530 m, *Dunn et al. 19* (MO).

Anthurium salviniae Hemsley, Diagn. Pl. Nov. Mexic. 36. 1878. TYPE: Guatemala. Volcán de Fuego, *Salvin s.n.* (holotype, K). Figures 15, 20, 270, 274, 276.

Anthurium giganteum Matuda, Madroño 10: 169. 1950. non Engl. 1898. TYPE: Mexico. Chiapas: Escuintla, Salto de Agua, *Matuda 18043* (holotype, MEXU; isotype, UC).

Anthurium enormispadix Matuda, Revista Soc. Mex. Hist. Nat. 11: 94. Dec. 1950. TYPE: Same as *Anthurium giganteum* Matuda.

Epiphytic, rarely epilithic; stem to 6 cm diam.; roots dense, usually ascending, some descending, moderately numerous, greenish to white, pubescent, moderately short and tapered, 3–6 mm diam.; cataphylls thick, fistlike, cucullate, rounded at apex, drying brown, persisting intact, ultimately becoming fibrous at base. *Leaves* erect to spreading; petioles (3)5–23 cm long, 10–20 mm diam., ± D-shaped to terete, flattened to sulcate adaxially, the margins not prominent, rounded abaxially (once reported as prominently 5–7-ribbed), the surface pale-speckled; geniculum paler and thicker than petiole, 0.7–2 cm long; blades moderately coriaceous, obovate to oblanceolate to broadly elliptic, acuminate to obtuse at apex, attenuate to rounded or truncate (rare subcordate) at base, (32)39–180 cm long, (9)13–50 cm wide, broadest usually above (sometimes at or near the middle), the margins slightly undulate; both surfaces semiglossy, medium green (B & K yellow-green 4/7.5) above, slightly paler below; both surfaces drying greenish to brownish green; midrib convexly raised at base, becoming acute toward the apex above, convexly raised at base, becoming obtusely raised toward the apex below; primary lateral veins 9–24 per side, convexly raised above and below; interprimary veins rarely present; tertiary veins weakly raised to obscure above, weakly raised to flat and darker than surface below; collective vein arising from near the apex or absent (often from below the middle in small plants), weakly raised, 3–5 mm from margin. *Inflorescences* spreading to usually pendent, shorter than leaves; peduncle 16–80 cm long, 2–5 mm diam., 3.1–10.3 × as long as petiole, terete; spathe spreading to recurled, coriaceous to subcoriaceous, purple or sometimes green tinged with red or purple (B & K yellow-green 6/5), lanceolate-linear, (4)10.5–40(50) cm long, 1–2.5 cm wide, inserted at 45–90° angle on peduncle, gradually acuminate at apex (the acumen cuspidate, inrolled), rounded to truncate or acute at base; spadix pale green when immature, soon lavender to dull violet-purple to purple-maroon, glaucous, long-tapered, slightly curved, (6)10–34(47) cm long, 4–15 mm diam. near base, 2–7 mm diam. near apex; flowers rhombic, 2.4–2.5 mm in both directions, the sides straight to sigmoid; 6–8 flowers visible in principal spiral, 4–12 in alternate spiral; tepals matte; lateral tepals 1.2–1.3 mm wide, the inner margins broadly rounded; pistils emergent but not raised, green; stigma linear to oblong-ellipsoid, 0.6–0.9 mm long; stamens emerging from the base in a slow, regular progression; anthers orange to pale yellow to creamy white, ca. 1 mm long, 0.9 mm wide, held at edge of tepals and inclined over pistil; thecae ellipsoid; pollen pale yellow-orange fading to white. *Infructescence* with spadix to 60 cm long; berries red, oblong-ellipsoid, rounded at apex, 10–15 mm long; mesocarp transparent, gelatinous; seeds 2 per berry, oblong, flattened, ca. 3–5 mm long.

Anthurium salviniae ranges from western Mexico (Chiapas), along the Pacific slope of Guatemala, and along the Atlantic and Pacific slopes from Nicaragua to Panama. There is also a single collection from Honduras (Atlantic slope) that appears to belong to this species. The species also occurs in Colombia, where it has been collected from Chigorodo and Dabeiba in Antioquia and Chocó departments. *Anthurium salviniae* occurs from near sea level to 1,600 m in wetter parts of tropical moist forest, in premontane wet, tropical wet, and also, rarely, in premontane rain forest.

This species is characterized by its cucullate cataphylls, large, mostly oblanceolate leaves with circinate vernation, usually pendant inflorescence with a slender peduncle and slender, long-tapered, pale lavender spadix and red berries.

Anthurium salviniae has long been called *A. tetragonum*, but that name is a synonym of *A. schlechtendalii*, a species ranging from Mexico to Honduras or Nicaragua on the Atlantic slope. Although leaves of the two species are very similar, *A. salviniae* can be distinguished by its long-tapered, pale lavender, glaucous spadix, long-tapered, spreading spathe, and by its fist-shaped, cucullate cataphylls. In addition, the leaves of *A. salviniae* usually dry darker and thinner. *Anthurium schlechtendalii* usually has a shorter, blunter spadix and a short, thick spathe that is usually reflexed and often twisted. The spadix is darker violet-purple, and is not at all glaucous at anthesis.

A collection in cultivation at the Missouri Botanical Garden from the Río Majé region of Panama, in Panamá Province, is unusual in having dark violet-purple rather than red berries.

COLOMBIA. ANTIOQUIA: Quebrada La Puerca–Malagon, 10 m, *Rentería et al. 4776* (MO); Río Claro, Pto. Triunfo–Medellín, S of Hwy., 5°54′N, 74°51′W, *Croat 56579* (MO); Río Sucio, Dabeiba, *Gutiérrez & Barkley 1822* (COL, US), *Johnson & Barkely 18C411* (US); Dabeiba–Chigorodó, 4 km NW of Dabeiba, 180–400 m, *Callejas et al. 4783* (MO); Mpo. Chigorodo, *Plowman 3175* (GH). CHOCÓ: Quebrada Resaquita, Mecana, 50 m, 6°16′N, 77°21′W, *Juncosa 1879* (MO). QUINDIO: Mpo. Montenegro, Río La Vieja, La María, 1,000 m, *Arbeláez et al. 333* (MO); Mpo. Turbo; Km 11 on Carretera Tapón del Darién, Leon–Lomas Aisladas area, 10–20 m, *Brand & Escobar 727* (MO). COSTA RICA. ALAJUELA: N of Zarcero, *Croat 43640* (MO); Naranjo–Quesada, Hwy. 15, 3.2 mi. N of Zapote, 1,560 m, *Croat 46916* (MO); Cañas–Upala Road, N of Bijagua, *Croat 36480* (COL, MO, NY); Río Cacao, 800 m, *Gómez 19568* (MO). Buena Vista de Zarcero, Finca Los Ensayos, 900–1,000 m, 10°16′N, 84°27′W, *Judziewicz 4404* (WIS). CARTAGO: SE of Platanillo, *Croat 36808* (MO); NE of Tapantí, *Lent 1034* (GH). GUANACASTE: Tilarán, *Standley & Valerio 44445* (US); Cerro Nubes, W slope, 2 km E of Silencio de Tilarán, 900 m, 10°28′N, 84°53′W, *Grayum et al. 4999* (MO); Lake Arenal, Río Chiquito–Río Caño Negro, 550–850 m, 10°27′N, 84°50′W, *Hammel et al. 15146* (MO); Parque Nacional Rincón de la Vieja, SE slopes of Volcán Santa María, above Estación Hacienda Santa María, 900–1,200 m, 10°47′N, 85°18′W, *Davidse et al. 23335* (CR, K, MO); on path from Puesta Santa María toward hot springs, *Garwood et al. 746b* (BM). PUNTARENAS: San Vito de Java, *Croat 32898* (MO); Cordillera de Talamanca, Río Guineal, Helechales, 1,100–1,200 m, 9°04′30″N, 85°05′W, *Davidse & Herrera 26240* (MO); Monteverde, Río Guacimál, Lechería, 1,500 m, 10°17′N, 84°48′W, *Hammel & Trainer 13830* (MO). GUATEMALA. ESCUINTLA: Escuintla–Sta. Lucía Cotz, *Standley 63469* (F). RETALHULEU: Ajaxa, *Standley 88227* (F); W of Retalhuleu, *Standley 87499, 88391* (F). SACATEPÉQUEZ: Las Lajas, *Standley 58294* (F). SAN MARCOS: La Trinidad, *Croat 40902* (CM, K, MEXU, MO, USCG), *40903* (MO). SANTA ROSA: Cuilapilla, *Standley 78060* (F); Naranjo, 1,200 m, *Hyde & Lux 4278* (G, K, NY, US). SUCHITEPÉQUEZ: E of Mazatenango, *Croat 32786* (MO). HONDURAS. ATLANTIDA: Lancetilla Valley, near Tela, *Standley 53228* (US). MEXICO. CHIAPAS: Escuintla, *Croat 43845, 43877* (MO), *Matuda s.n.* (MEXU), *16377* (F, MEXU, MO), *16776* (F, MEXU), *18043* (MEXU, UCLA), *18381* (DS, MEXU, PMA), *18519* (DS, MEXU, UCLA); Finca California–summit of Monte Ovando, *Croat 47572, 47573* (MO); Guatimoc, *Miranda 1763* (MEXU). NICARAGUA. JINOTEGA: Las Camelias–La Salvadora, rd. from Hwy. 3 through La Fundadora, 1,100–1,150 m, 13°05–06′N, 85°53–54′W, *Stevens & Grijalva 15326* (MO); La Palestrina–La Fundadora, rd. from Hwy. 3 through La Fundadora, 1,150–1,250 m, 13°03–04′N, 85°54′W, *Stevens & Grijalva 15325* (MO). MATAGALPA: Quebrada El Quebradón, Macizos de Peñas Blancas, WNW of Hacienda San Martín, 1,400–1,600 m, 13°15′N, 85°39′W, *Stevens et al. 21219* (MO). MATAGALPA–JINOTEGA: Quebrada El Quebradón, Macizos de Peñas Blancas, N of Hacienda San Martín, 950–1,400 m, 13°14–15′N, 85°39′W, *Stevens & Riviere 20892-b, 21035* (MO). RÍO

SAN JUAN: San Juan del Norte, *Smith 87* (MO). ZELAYA: Cerro El Inocente, S slope, *Stevens 6793* (MO). PANAMA. WITHOUT LOCALITY: *Duke 11427* (OS). CANAL AREA: Balboa, *Standley 28564* (MO); Gatún, hills W of Canal, *Standley 27210* (US); Culebra, *Gaillard 2698* (US); Frijoles, *Pittier 2679* (US); Gorgona-Gatún, *Pittier 2278* (US); Las Cascadas, *Dodge & Hunter 8651, 8659a, 8662* (MO); Obispo, *Standley 31719* (US); Salamanca Hydrographic Station, *Dodge et al. s.n.* (MO); Summit Gardens, *Croat 10281* (MO), *32983* (M, MICH, MO, RSA, TEX); Ancón Hill, Orchid Garden, *Bartlett & Lasser 16609* (MICH, MO); Barro Colorado Island, *Bailey & Bailey 72* (BH), *Croat 4231, 4554, 6511, 7292, 8495, 8512, 9534, 11325* (MO), *7920, 10195* (MO, PMA), *Ebinger 181* (MO), *Shattuck 638* (MO); Gatún Lake, *Standley 31343* (US); Madden Dam, Azote Caballo Road, *Dodge 16579* (MO); Quebrada Ancha, *Steyermark & Allen s.n.* (MO); Río Casaya headwaters, E of Gamboa, *Nee 9024* (MO); Río Indio de Gatún, *Pittier 2801* (US). CHIRIQUÍ: SW of Portobelo, *Liesner 1075* (MO, US); mining rd. above San Félix, 18–27 mi. off Panamerican Hwy. (above Chamí), 1,200–1,500 m, *Croat 33085* (B, C, K, MBM, MO, US); Cerro Colorado, *Antonio 1527* (MO), *Croat 33498* (MO, UCLA); Puerto Armuelles region, W of Puerto Armuelles, San Bartolo Limite, *Busey 593* (MO). COLÓN: Portobelo Region, Río Guanche, 1–4 km S of Portobelo hwy., 0–50 m, 9°30′N, 79°40′W, *Knapp & Schmalzel 3598* (MO), *Knapp et al. 4609* (MO); Río Boquerón, E of Salamanca, 50 m, 9°35′N, 79°32′W, *Knapp et al. 5826* (MO, B). DARIÉN: line CC, *Duke 5235* (MO); NE of Jaqué, *Sytsma & D'Arcy 3433* (K, MO); Cerro Sapo, Río San Antonio at base of cerro, 5 km S of Garachiné, 130 m, 7°59′N, 78°25′W, *Hammel et al. 14802* (MO), *14811* (M, MO); Cerro Tacarcuna, S slope, *Gentry & Mori 13892* (MO); Serranía de Pirre, *Croat 37751* (MO). PANAMÁ: S of Alcalde Díaz, *Nee 8566* (MO); Alajuela, *Pittier 2344* (US); Tortí Arriba, *Folsom et al. 6584* (MO); Cerro Brewster, SW of mountain, *Lewis et al. 3475* (MO); Río Majé, *Croat 34441* (MO), *34600* (F, K, MO, US); Serranía de Majé, *Folsom & Collins 1701* (MO); confluence of Río Ambroino and Río Ipeti, 100 m, 8°57′N, 79°32′W, *Churchill & de Nevers 4479* (MO); Parque Nacional del Darién, ridge between Río Topalisa and Río Pucuro, ca. 13 km E of Pucuro, 8°03′N, 77°20′W, 450–600 m, *Hammel et al. 16193* (MO).

Anthurium santiagoense Croat, sp. nov. TYPE: Ecuador. Morona–Santiago: Proveduria, confluence of Río Bomboiza and Río Zamora, 600 m, 3°25′S, 78°27′W, *Palacios 1492* (holotype, MO 3420759; isotypes, NY, QAME). Figure 283.

Planta terrestris; internodia brevia, 1.5–2 cm diam.; cataphyllum findens in fibras lineares tenues; petiolus 24.5–27 cm longus, 1–1.2 cm diam., triangularis; lamina late elliptica ad oblongo-elliptica, 75–97 cm longa, 21.5–29 cm lata; pedunculus 20–48 cm longus, 5–11 mm diam., stipes 1–3 mm longus; spadix atropurpureus, cylindricus, 6.5–7 cm longus, 5–6 mm diam.

Description based on dried material only. Terrestrial; stem 1.5–2 cm diam.; roots few, pale grayish, pubescent, elongate, to 4 mm diam.; cataphylls probably coriaceous, 10–13.5 cm long, acute at apex, yellow-green, persisting as fine, pale, linear fibers; petioles 24.5–27 cm long, 1–1.2 mm diam., triangular, flattened to broadly sulcate adaxially, the margins acute, acutely angled abaxially; blades subcoriaceous, ± broadly elliptic to oblong-elliptic, abruptly acuminate to long-acuminate at apex (the acumen 15–20 mm long), narrowly acute at base, 75–97 cm long, 21.5–29 cm wide, broadest just above the middle, matte to weakly glossy, greenish; midrib prominently raised above, higher than broad and paler than surface below; primary lateral veins 25–33 per side, departing midrib at 60–75° angle, straight-ascending to the collective vein, slightly raised above and below, slightly paler than surface below; interprimary veins almost as conspicuous as primary lateral veins, drying raised above and below; tertiary veins visible when dried, raised; collective vein arising from near the base, drying raised above and below, equally as prominent as primary lateral veins, 7–20 mm from margin. *Inflorescences* with peduncle 20–48 cm long, 5–11 mm diam., drying greenish; spathe reflexed, subcoriaceous, green, broadly lanceolate, 7–8 cm long, 1.8–2.6 cm wide, broadest near the base, abruptly acuminate at apex, 4 mm long; stipe 7–17 mm long in front, 1–3 mm long in back; spadix deep purple, cylindroid, erect, sometimes slightly curved, 6.5–7 cm long, 5–6 mm diam. midway; flowers ± square, 1.5–2.1 mm in both directions; 7–10 flowers visible in principal spiral, 6–7 in alternate spiral; lateral tepals 0.9–1.2 mm wide, the inner margins ± straight, the outer margins 2-sided; pistils somewhat exserted; stigma ellipsoid, 0.3 mm long, droplets drying as abundant crystals and persisting; stamens emerging well above tepals; filaments translucent, flattened, 0.7 mm wide; anthers yellow, 0.4–0.5 mm long, 0.6 mm wide; thecae oblong, 0.2–0.3 mm wide, slightly divaricate; pollen fading to tan. *Infructescence* not seen.

A member of series *Multinervia*, *Anthurium santiagoense* is endemic to Ecuador, where it is known from the Río Santiago watershed (hence the name) in the Serranía de Cutucú and in Morona–Santiago Province at 600 to 1,830 m, in premontane moist and tropical moist forest life zones.

This species is characterized by its large, unusually broadly elliptic leaf blades which dry green and have numerous primary lateral veins, its relatively long, more or less triangular petioles, and its deep purple, cylindroid spadix. Characteristic also are the exserted stamens and yellow anthers.

Anthurium santiagoense is readily recognizable and not likely to be confused with any other species. The only other member of series *Multinervia* on the eastern slope of the Andes which approaches *A. santiagoense* in size is *A. fasciale*, which has more or less oblong leaf blades with more irregular primary lateral veins, and petioles that are rounded abaxially. *Anthurium narinoense*, from the Pacific slope in Colombia, is remarkably similar in overall appearance and differs mainly by its more slender spadix.

ECUADOR. MORONA-SANTIAGO: Río Bomboiza and Río Zamora confluence, Proveduria, 600 m, 3°25'S, 78°27'W, *Palacios 1492* (MO, NY, QAME); Cordillera de Cutucú, W slopes, Logroño-Yaupi, 2°46'S, 78°6'W, *Madison et al. 3382* (SEL).

Anthurium sarukhanianum Croat & Haager, sp. nov. TYPE: Mexico. Guerrero: 2-3 km N of Zíhuatanejo, dry slopes, less than 100 m, *Haager s.n.* (holotype, MO 3582582; isotypes, MEXU, PR). [Cultivated in Praha and Brno.] Figures 277, 284.

Planta epilithica; internodia brevia, ad 3 cm diam.; petiolus U-formatus, adaxialiter sulcatus, abaxiliter rotundatus, 6-10 cm longus, 12-17 mm diam.; lamina oblanceolata ad anguste obovata, 40-75 cm longa, 17-23 cm lata; nervis primariis lateralibus 9-12 utroque; pedunculus 20 cm longus; spatha erecta, viridis multum suffusa purpurea introsum, 3.5-5 cm longa, 2.5-3.5 cm lata; spadix clavatus, 4-5 cm longus, 1.3-1.7 mm diam.

Epiphytic, to less than 1 m tall; stem short, 3 cm diam.; roots dense, 3-5 mm diam., whitish (green when moistened); cataphylls triangular, 7 cm long, weathering into brown fibers. *Leaves* erect-spreading; petioles 8-12 cm long, 12-18 mm diam., obtusely U-shaped, deeply sulcate adaxially, the margins erect to incurved (in plants cultivated under epiphytic conditions), rounded abaxially; geniculum shaped like and paler than petiole, 1.2-1.7 cm long; blades moderately coriaceous, oblanceolate to narrowly obovate, shortly acuminate at apex, acute to narrowly rounded at base, 40-75 cm long, (12)17-23 cm wide, the margins broadly and conspicuously undulate; upper surface weakly quilted, glossy, medium green, lower surface matte, slightly paler; midrib above convexly raised (with obscure medial rib on drying), becoming convexly raised toward the middle, below prominently convexly raised and weakly speckled; primary lateral veins 9-12 per side, departing midrib at 40-45° angle, moderately straight to the margin, then ascending, convex on both surfaces; interprimary veins lacking or few; major tertiary veins weakly sunken above, weakly raised and slightly darker than surface below; reticulate veins visible only on lower surface; collective vein absent. *Inflorescences* erect, much shorter than leaves; peduncle 20 cm long, 5 mm diam., drying 3.5 mm diam., 2-3 × as long as petiole, terete; spathe erect, broadly ovate, 3.5-5 cm long, 2.5-3.5 cm wide, green, heavily tinged or mottled with purple on both surfaces, especially on the inner surface and along margins outside, inserted at 30° angle on peduncle, rounded and retuse at apex (the acumen short apiculate), rounded to subtruncate at base, the margins tightly recurled, meeting at 180° angle, then decurrent for a short distance; spadix medium green, clavate, sessile, held at 160° angle from peduncle, 5 cm long, 7 mm diam. near base, 1.3-1.7 mm diam. near apex, broadest just below the apex, broadly rounded at apex, evenly tapered to the base; flowers rhombic to sub-4-lobed, 2.3-2.7 mm long (fresh), 1.8-2.2 mm long (dry), 1.8-2.3 mm wide (fresh), 2-2.5 mm wide (dry), the sides almost straight to smoothly sigmoid parallel to spiral, jaggedly sigmoid perpendicular to spiral; 13-16 flowers visible in principal spiral, to 20 or more in alternate spiral; tepals semiglossy, minutely papillate, with few subrounded inclusions visible through the epidermis, drying matte, light reddish brown, weakly warty, with a thin, loose layer of wax; lateral tepals 1.2-1.5 wide, shield-shaped, the inner margins almost straight, the outer margins weakly acuminate; pistils green, umbonate, protruding weakly into the space between the tepals, the exposed area 0.5 mm diam., soon completely obscured by the stamens; stigma linear, drying 0.35 mm long; stamens emerging slowly beginning at the middle of the spadix and proceeding toward both ends, the laterals preceding the alternates, clustered tightly over the pistil; anthers whitish, 0.5 mm long, 0.6 mm wide, held at the level of the tepals; thecae narrowly ovoid, somewhat divaricate. *Infructescence* not known.

Anthurium sarukhanianum is narrowly endemic to western Mexico, known only from the type locality in the state of Guerrero, where it is locally common.

It can be confused with *A. schlechtendalii* subsp. *jimenezii* or *A. halmoorei*, which occur in similar habitats in western Mexico, but can be distinguished from either by its conspicuously clavate spadix, a feature unique among Central American species of *Pachyneurium*.

This species was first collected in 1977 by Jiri Haager of Prague, Czechoslovakia, and is named in honor of José Sarukhán, Director of the Instituto de Biología of the Universidad Autónoma de México, who assisted in the preparation of Haager's expedition in Mexico.

MEXICO. GUERRERO: 2–3 km N of Zíhuatanejo, near sea level, *Haager s.n.* (MO, MEXU, PR).

Anthurium schlechtendalii Kunth, Enum. Pl. 3: 75. 1841.

a. Anthurium schlechtendalii subsp. **schlechtendalii**. TYPE: Mexico: Hacienda de La Laguna, *Schiede & Deppe s.n.* (not seen). Figures 278, 285, 286.

Anthurium mexicanum Liebm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn 1: 21. 1849. TYPE: Mexico. Veracruz: between Colipa & Misantla (not seen).
Anthurium kunthianum Liebm., Ann. Sci. Nat. Bot. ser. 4, 2: 372. 1854. TYPE: Mexico (no type cited).
Anthurium brachygonatum Schott, Prodr. Aroid. 468. 1860. TYPE: Mexico. Veracruz: Córdoba, *Kerber s.n.* (holotype, B).
Anthurium tetragonum Hook. ex Schott, Prodr. Aroid. 475. 1860. TYPE: locality unknown, Schott Aroid Drawing #541 (Schott Aroideae 541 serves as type).
Anthurium fortinense Engl., Bot. Jahrb. Syst. 25: 366. 1898. TYPE: Mexico. Veracruz: Fortín, *Kerber 9b* (holotype, B).
Anthurium tikalense Lundell, Wrightia 3:161, fig. 55. 1966. TYPE: Guatemala. Petén: Tikal National Park, on temple in Group "H," Mar. 1961, *Lundell 18198* (holotype, LL).

Epiphytic or epilithic; stem usually short, but reported to 40 cm long, 2.5–5.5 cm diam.; leaf scars obscured by root mass, to 4.2 cm wide; roots numerous, dense, ascending to descending, greenish to tan, smooth, short to moderately elongate, tapered, 3–8 mm diam.; cataphylls moderately coriaceous, curved, 7.5–16 cm long, caudate-apiculate at apex, drying brown, initially persisting intact, but eventually as a reticulum of fibers. *Leaves* erect; petioles (2.5)10–23 cm long, 4–20 mm diam., quadrangular to trapezoidal, rarely D-shaped or terete, mostly widest adaxially, flattened to shallowly sulcate and with sharp margins adaxially, sharply to bluntly ribbed abaxially, rarely rounded; geniculum somewhat thicker and paler than petiole, 1–2 cm long; blades coriaceous, obovate-elliptic to broadly oblanceolate, acute to short-acuminate at apex (the acumen apiculate), acute to obtuse at base, (16.5)30–140(175) cm long, (4.5)10–60 cm wide, broadest near or above middle, the margins prominently undulate; both surfaces matte to semiglossy, medium green above, paler below, drying greenish; midrib flat to weakly raised at base, becoming more acute (sometimes weakly ribbed), diminishing and sunken at apex above, raised and square at base below, convexly raised at apex; primary lateral veins 15–16 per side, departing midrib at 50° angle, straight almost to the margin, then arcuate toward the apex, sharply to convexly raised and paler than surface above and below; tertiary veins flat, scarcely visible above, darker than surface below; collective vein arising from near the apex, sunken above, raised below, 2–5 mm from margin. *Inflorescences* erect to spreading, sometimes pendent, shorter than leaves; peduncle 10–43 cm long, (4)6–13 mm diam., 1.6–7.4× as long as petiole, plain green or tinged with violet-purple, terete to weakly flattened and ribbed; spathe spreading to strongly reflexed, coriaceous, plain green or heavily tinged with violet-purple to red or entirely purple, narrowly triangular to lanceolate, (8)10–28 cm long, (0.7)1.5–5 cm wide, inserted at 70° angle on peduncle, acuminate at apex (the acumen inrolled), obtuse at base; spadix green to gray to brown to red to purplish violet, tapered, curved, (5.5)8–29 cm long, (7)17–20 mm diam. near base, 4–6 mm diam. near apex; flowers square, (2)2.2–2.6 mm in both directions, the sides straight to weakly sigmoid; 7–17 flowers visible in principal spiral, 10–14 in alternate spiral; tepals matte, purplish punctate; lateral tepals 1–1.3 mm wide, the inner margins convex and turned up against pistil; pistils emergent to 1 mm, dark purple to brown; stigma linear, 0.8 mm long, droplets appearing ca. 4 days before stamens emerge; stamens emerging rapidly from the base, lateral stamens emerging to midway before alternates emerge; filaments translucent, soon retracting, 0.2–0.5 mm long, 1 mm wide; anthers yellow to pale orange, 0.9 mm long in both directions, inclined over the pistil; thecae ± oblong, scarcely divaricate; pollen orange fading to cream, yeasty-scented at anthesis. *Infructescence* arching-pendent; spathe persisting; peduncle to 4 cm diam.; spadix 15.5–65(80) cm long, 4–6(9) cm diam.; berries bright red, obovoid to oblong to ellipsoid, rounded to acute at apex, 10–29 mm long, (5)6–7 mm diam.; pericarp thickened; mesocarp pulpy, white, with numerous raphide cells; seeds 2 per berry, greenish white, ovoid to oblong, flattened, 3–6 mm long, 1.5–3 mm diam., 1–1.5 mm thick, astringent to taste.

Anthurium schlechtendalii consists of two subspecies. Subspecies *schlechtendalii* ranges from Mexico (central Veracruz) to Nicaragua on the Atlantic slope, from near sea level to 1,600 m (most common below 1,000 m) in various life zones.

Anthurium schlechtendalii is characterized by its trapezoidal to quadrangular petioles, coriaceous spathe, tapered spadix, and bright red berries.

This taxon is most easily confused with *A. schlechtendalii* subsp. *jimenezii*, from the Pacific slope of Mexico, which differs by occurring in seasonally drier habitats, and in its generally smaller leaves and frequently narrowly ovate, usually erect spathe. *Anthurium schlechtendalii* subsp. *schlechtendalii* may be confused with *A. upalense* in Nicaragua, where they both occur. See the discussion under that species for differences.

Anthurium schlechtendalii merges into the range of *A. salviniae* only in a few areas in the mountains of southeastern Chiapas, such as on Monte Ovando. Specimens collected in the municipios of Siltepec, Escuintla, and Acacoyagua tend to have leaf blades approaching the texture of those of *A. salviniae*, but the inflorescences and cataphylls are those of typical *A. schlechtendalii*. See the discussion following *A. salviniae* for separation characters for these two taxa.

In discussing Mexican aroids, Bunting (1965) included an illustration of a plant cultivated at Cornell University and reputedly collected by H. Moore in Mexico. This is almost certainly *A. crenatum* (L.) Kunth and perhaps represents a mixing of labels in the greenhouse. Two vouchers presumably prepared from this plant (*Bunting 1579* and *Nicolson 603*) tend to confirm this notion. *Anthurium crenatum*, as far as is known, is restricted to Puerto Rico and the Virgin Islands.

Studies of populations of *A. schlechtendalii* in Mexico and elsewhere show most morphological characters to be variable. The petioles, although usually trapezoidal in cross section with the angles moderately acute, may be broadly rounded abaxially, such as those illustrated by Schott for *A. brachygonatum* (see Schott drawing No. 473 (W)). Although Bunting (1965) considered the latter distinct from *A. schlechtendalii*, it is here believed to be one form of this unusually variable species.

BELIZE. NO FURTHER LOCALITY: *Schipp S402* (MICH, MO, NY, UC); Camp Cuello, *Lincoln 36* (MO). BELIZE: *Bartlett 11325* (MICH); Gracie Rock, 1.1–4 mi. S of mi. 22 on Western Hwy., 100 m, *Croat 23851, 23896* (MO), *Liesner & Dwyer 1472* (MO); Northern River, *Gentle 1291* (F, K); Western Highway, Gracie Rock, *Whitefoord 3171* (BM). CAYO: *Chanek 53* (MICH, MO); W of Hummingbird Hwy. at point 7 mi. S of jct. with Western Hwy., Line Transect 1, 90 m, *Spellman & Newey 1984* (MO); Waterhole camp, Vaca, *Gentle 2567* (MICH); ca. 10 km SW of San Ignacio, lx Chel Farm, along Panti Trail, 17°6′N, 89°0′W, *Balick et al. 1794* (MO); Mt. Pine Ridge, Blancaneaux Lodge, *Dwyer 12658* (MO); Río de La Flor, 6 mi. S of Grano de Oro, La Flor, 570–670 m, *Croat 23811* (MO). COROZAL: *Arnason & Lambert 17186* (MO), *Gentle 597* (MICH); Tiger Savana, 12 km W of Little Belize, 10 m, 18°11′N, 88°17′W, *Davidse & Brant 32604* (CM, M, MICH, MISSA, MO, PMA, RSA). ORANGE WALK: Orange Walk–San Pablo, *Sutton et al. 130* (BM, MO); 5 km N of August Pine Ridge, road to Trinidad, 100 m, *Davidse & Brant 32792* (MO, RSA). TOLEDO: Moffredye Lagoon, *Gentle 5372* (LL, TEX); Rideau Camp, 40 m, *Whitefoord 1801* (BM); Salamanca, 40 m, *Whitefoord 1968* (BM); 1.5 mi. S of Mayan village of San José, 5 mi. W of Colombian Forest Station, *Croat 24297, 24333* (MO); 6.7 mi. N of Columbia Forest Station, *Croat 24431* (MO), *Vanderveen 658* (MO); Maya Mts., *Boutin & Schlosser 5144* (MO); vic. of junction of Richardson Creek and Bladen Branch, 80–420 m, 16°32′N, 88°45′W, *Davidse & Brant 32025* (K, MO, NY, US); Río Grande, *Gentle 4723* (TEX). GUATEMALA. ALTA VERAPAZ: Tucurú–El Estor, above Papalha, 15 mi. W of Teleman, Finca Argentina, 250–650 m, *Croat 41536, 41551* (MO); La Tinta, *Smith 1530a* (US); Lago Izabal, Tucurú-El Estor, Route 7E, 150–300 m, *Croat 41525, 41529* (MO). ESCUINTLA: 5 km SW of Palín, *Harmon 2420* (UMO). HUEHUETENANGO: Ixcán–Finca San Rafael, *Steyermark 49411* (F); Río Trapichillo, Paso del Boquerón, below La Libertad, 1,200–1,300 m, *Steyermark 51171* (MO). IZABAL: 15.8 km S of Modesto Méndez, 70 m, *Harmon & Fuentes 2115* (MO, UMO); 7 mi. S of Puerto Barrios, 50 m, *Croat 41802* (MO); 1 mi. E of Santo Tomás, 4 mi. SW of Puerto Barrios, 50 m, *Croat 41839* (MO); E of El Estor, *Jones & Facey 3456* (NY, TEX); Quiriguá Viejo, *Standley 24053* (NY, US); Virginia-Lake Izabal, *Steyermark 38769* (F); Lago Izabal, *Jones & Facey 3437* (NY, TEX). PETÉN: 5 mi. S of entrance to Tikal National Park, *Croat 24753* (MO); Dolores, *Contreras 2254* (LL); El Paso, *Herman 14664, 14671* (MICH); *Lundell 1573* (MICH); La Libertad, *Lundell 2873* (MICH); Santa Teresa, *Lundell 2708* (MICH), *2889* (MICH, NY); Uaxactun, *Bartlett 12295, 12296* (MICH); Lago Macanche, Fallabon road, *Contreras 920* (LL); Tikal National Park, Tikal, *Bernhardt T6* (MO), *Contreras 1618* (LL), *Lundell 15410* (LL, TEX), *18198* (LL). SAN MARCOS: Volcán Tajumulco, *Steyermark 37078* (F). ZACAPA: 2 mi. N of Route CA 9, 41 mi. S of turnoff to Petén Morales, Finca Agua Fría, 150 m, *Croat 41879* (MO). HONDURAS. COLÓN: Trujillo, *Clewell et al. 4335* (MO). COMAYAGUA: Lago de Yajoa, *Zonigo 495* (TEFH), *590* (TEFH), *661* (TEFH), *867* (TEFH). COPÁN: E of Copán, *Croat 42508, 42521* (MO); 35 km E of Copán, *Blackmore & Chorley 3772* (BM). CORTÉS: 2–3 mi. SW of Omoa on road from Puerto Cortes to Guatemala border, 0 m, *Croat 42564* (MO); 7 mi. S of Portrerillos on Hwy. 1, 100 m, *Croat 42706* (MO); Guatemalan border, Corinto, *Nelson et al. 2904* (MO); La Pimienta, *Molina 5623* (F). GRACIAS A DIOS: Río Patuca, 175 m, *Clewell 4564* (MO). OLANCHO: Río Chiquito, 2 km above Río Grande, *Blackmore & Heath 1843* (BM, MO); Río Olancho, Gualaco–San Bonito Oriental, 7.4 mi. NE of San Estéban, 540 m, 15°20′N, 85°42′W, *Croat & Hannon 64362* (MO). SANTA BÁRBARA: road on NW side of Lago de Yojoa, 700 m, *Croat 42757* (B, MO); Punta Gorda, W side of Lago de Yojoa, 600 m, 14°50′N, 88°08′W, *Balick et al. 1734* (MO); Santa Rosa de Copán–San Pedro Sula, 51.3 mi. WSW of junction of main San Pedro Sula–Tegucigalpa Hwy., Hwy. 18, 500 m, 15°18′N, 88°25′W, *Croat & Hannon 63871* (MO). YORO: Coyoles, *Yuncker et al. 8132* (K, MO, NY, US); Las Flores, *Yuncker et al. 8174* (F, MO, NY); Las Minas, 60 m, *Ruiz 116* (NY); slope above Lake Yojoa, *Clewell 3114* (FSU). MEXICO. CAMPECHE: Francisco Escarcega-Champoton, 0–100 m, *Mayo & Madison 369* (K). CHIAPAS: Huixtla–Motozintla de Mendoza, 25 km from Huixtla, 650 m, *Croat 47225* (MO); Chiapa de Corzo–Pichucalco, Hwy. 195, 0.5 km from junction with Hwy. 190, 1,000 m, *Croat 46437* (MO); 20–30 mi. SW of El Jocote on road to Motozintla, 700–900 m, *Croat 40706* (MO); 20

mi. N of Ocozocoautla, road to Apitpac near Km 31, 700 m, *Croat 40653* (K, MO); 13 mi. N of Ocozocoautla, road to Apitpac near Km 21, 900 m, *Croat 40626* (MO); 6 mi. N of Ocozocoautla, road to Apitpac, 1,000 m, *Croat 40587* (MO); Palenque-Ocosingo, 27 mi. SW of Palenque, Hwy. 199, 210 m, *Croat 40319* (MO); Palenque–Bonampak, 89–90 mi. SW of Palenque, 350–370 m, *Croat 40215* (MO); along Hwy. 195, 8 mi. N of Pichucalco, 2 mi. S of Chiapas border, 80 m, *Croat 40074* (MO); San Cristóbal–Palenque, 97 km NE of San Cristóbal, San Cristóbal de Las Casas, 1,130 m, 17°27′N, 92°4′W, *Hammel et al. 15616* (MO); Palenque, 170 m, *Davidse et al. 20334* (MO); 2 mi. S of Chiapas border along Hwy. 195, 8 mi. N of Pichucalco, 80 m, *Croat 40086* (MO); Motozintla de Mendoza–Siltepec, 2 mi. W of Motozintla, 1,400 m, *Croat 47250* (MO); ruins of Bonampak, 670 m, *Hoover 282* (MO); Motozintla–Huixtla, 15 mi. S of Motozintla, 900 m, *Croat 40766* (MO); road to Finca Tres de Mayo, 3 mi. NE of El Triunfo, 13 mi. NE of Escuintla, 350 m, *Croat 43879* (F, GH, K, MO, PMA, VDB); Acacoyagua, *Matuda 19646* (DS); Angel Albino Corzo, *Ton 3880* (MAD, DS); Bochil, *Roe et al. 1132* (WIS), *Ton 2587* (DS); Chiapa de Corzo, *Breedlove 26872* (DS); Escuintla, *Matuda 17973, 19645* (MEXU); Huixtla–Motozintla, *Breedlove 28609* (DS); Ixtapa, *Laughlin 723* (DS, MICH, NY), *Laughlin 1599* (DS, MEXU, TEX); Jitotol, *Thorne & Lathrop 41341* (DS); Las Margaritas, *Breedlove 33199, 33446* (DS); Siltepec, *Matuda 18798* (MEXU); ruins of Yaxchilan, Ocosingo, *Breedlove 33872* (DS); Ocozocoautla de Espinosa, *Breedlove 29004, 36555* (DS), *30358* (DS, MO), *MacDougall H261* (NY); Pichucalco, *Breedlove 35048* (DS), *Gilly & Hernández 182* (MICH); Nuevo Acosta Solistahuacán, *Breedlove 26042* (DS), *Roe et al. 1239* (US); Raudales Mal Paso, *Quintero 3441* (MEXU); Tenejapa, *Breedlove 6242* (DS, F, MICH), *11731* (F, MICH, TEX), *Ton 350* (DS); Tuxtla Gutiérrez, *Guzman 13* (MEXU); 20 km S of Palenque, road to Ocosingo, 12–20 m, *Mayo 32* (K); Mpo. El Bosque, Simojovel de Allende, El Bosque, 1,219 m, *Breedlove 51732* (CAS, DS); Mpo. Mapastepec, Sierra de Soconusco, road to Tuxtla Gutiérrez from Hwy. 200, 5.5 mi. NW of turnoff to Mapastepec, 15°32′N, 92°48′W, *Croat & Hannon 63352* (B, MO, NY, US); Mpo. Ocosingo, 5 km SW of Santo Domingo, 120 km SE of Palenque on road to Bonampak, 600 m, *Davidse et al. 20429* (MO); Mpo. Ocozocoautla de Espinosa, 3 km N of Ocozocoautla, road to Mal Paso, 900 m, *Breedlove & Smith 21982* (DS, MO); Mpo. Palenque, 25 km S of Palenque, Cascada Mizola, road to Ocosingo, 300 m, *Breedlove & Davidse 55398* (CAS). OAXACA: no further locality, *Calderón 145* (GH); Parque Nacional de Laguna Temazcal, Temazcal, N end of rd. across dam, 150 m, 18°25′N, 96°25′W, *Hammel & Merello 15455* (MO); Teotitlán del Camino–Chilchotla, 1.2–3.8 mi. past turnoff to Huatla de Jiménez, 1,265 m, *Croat 48374, 48396* (MO); Teotitlan del Camino–Huatla de Jiménez, near junction of road to Chilchotla, 1,320 m, *Croat 48296* (MO); hill 5 km S of Tuxtepec, 100 m, *Conrad & Conrad 3251* (MO); 8.5 mi. NE of Valle Nacional, *Thurm et al. 231* (UMO); Tuxtepec–Oaxaca, 0.5–4.5 mi. S of Valle Nacional, 120–450 m, *Croat 39707, 39708, 39738* (MO); 8 km S of Matías Romero, 100 m, *Davidse et al. 30195* (CM, MO); Tuxtepec–Oaxaca, Hwy. 175, 6 mi. W of Valle Nacional, 660 m, *Croat 39756* (MO); Chinantla, *Ramírez 144* (MEXU); Matatengo Gorge, *Croat 32712, 32717* (MO); Santo Domingo Tehuántepec, *Williams 70, 83* (MICH); Temascal, *Sousa 936, 1037, 1801* (MEXU); Tuxtepec, *Calderón 844* (MICH), *Miranda 4274* (MEXU), *Moore & Bunting 8907* (BH), *Quintero 1820* (MEXU), *Rzedowski 25480, 25483* (US), *Sousa 1809, 1825* (MEXU), *Webster & Breckon 15400* (DAV); Esmeralda–Río Manea, 11.5–13.5 mi. S of Esmeralda, Uxpanapa, 90–110 m, 17°4′N, 94°45′W, *Croat & Hannon 63277* (MO, US); Trapiche de la Concepción, 1,000 m, *Liebman s.n.* (K); Cerro El Cacao (Sta. Cruz), Concepión del Progreso, Putla, 1,020 m, *Mendoza 1516-A* (MEXU); Cerro Concordia, *Morton & Makrinius 2731* (F, US); Dtto. Juchitán, Matías Romero–La Ventosa, 26 km S of Matías Romero, Route 185, 250 m, *Lorence & Jrigos 3093* (MO); Dtto. Juchitán, Mpo. Matías Romero, La Laguna–Sarabia, 7.2 km W of Esmeraldas, 200 m, 17°7′N, 94°49′W, *Wendt et al. 3634* (MO); Mpo. Santa María Chimalapa, Santa María, 300 m, 16°55′N, 94°40.5′W, *Hernández 1167* (CHAPA, MO); Dtto. Tuxtepec, E arm of Presa Miguel Alemán, Temascal, 200 m, *Neill 5400* (MO); Mpo. Acatlán, Cerro Buenos Aires, intersection 2 km S of Corrales on road to Capilla, 4 km NW of Lindero, 70 m, 18°28′N, 96°38′W, *Gereau et al. 2209* (MO); 8 mi. from Acatlán on ranch Campo Chico, *Butterwick 59* (LL); Mpo. Soyaltepec, 1 km S of S end of main dam of Presa Miguel Aleman, 140 m, 18°14′N, 96°23′W, *Gereau et al. 2237* (MO). QUINTANA ROO: 6 km N of Xelha, *Téllez & Cabrera 3233* (MEXU, MO). TABASCO: SE of Teapa, Km 4 on road to Tacotalpa, 325 m, *Croat 47894* (MO); 3 km E of Teapa along road to Jalapa, 40 m, *Croat 40109* (MO); Km 34 S of Villa Hermosa, 55 m, *Croat 40069* (K, MO, RSA, US); Baláncán, *Valdivia 2028, 2052* (XAL); NW of Cárdenas, *Barlow 26/10* (WIS); 9 km E of Teapa, road to Jalapa, 200 m, *Mayo & Madison 343* (K); Cerro Las Campanas, 3 km E of Teapa, 50 km S of Villahermosa, 50–100 m, *Conrad et al. 2866* (MO); Río Teapa, 2 km SE of Teapa, 20 m, *Davidse et al. 29522* (MO, RSA); Mpo. Tacotalpa, 0.4 km E of Tacotalpa, *Cowan et al. 3421* (MO). VERACRUZ: no further locality, *Orentt 2950* (MO); Fortín, *Kerber 9* (B); 3 km N of Catemaco, 400 m, 18°30′N, 95°10′W, *Solheim & Powers 851* (WIS); Cervecería Moctezuma hydraulic plant, 1,000–1,150 m, *Croat 39414* (DUKE, ENCB, HBG, MO, QCA, WIS); Catemaco, *Sousa & Sousa 14* (MEXU), *Menéndez 7599* (MEXU); Lago Catemaco, *Boege 1257* (CAS); Mun. Cuitlahuac, 250 m, *Hansen & Nee* (MO); Hidalgotitlán, 17°47′N, 94°38′W, *Dorantes 2862, 3099* (XAL), *Valdivia 23, 138, 614, 799, 870, 1038, 1045, 1115, 1315, 1343, 1622* (XAL), *171, 236* (MO, XAL), *191, 309, 476, 533* (MEXU), *222, 731, 1165, 1285, 1674* (MO), *275, 667, 907, 931, 1196* (MEXU, MO, XAL), *458, 1094* (MEXU, XAL), *Vázquez 582* (BM, MO, XAL); Hacienda Álvaro Obregón, 149 m, 17°47′N, 94°38′W, *Valdivia 291, 421* (MEXU, MO); Laguna, Hidalgotitlán, 160 m, 17°16′N, 94°33′W, *Valdivia 689* (MO); 5 km from La Estación de Biología de Los Tuxtlas, Laguna Escondida, 300 m, *Soto et al. 16* (MEXU, MO); 170–200 m, *Gentry et al. 32391* (MO), *Dillon et al. 1838* (MO), *Menéndez 157* (MEXU, MO), *Cochrane & Cochrane 8625* (MO), *Calzada 455* (MEXU, MO); Valle de Córdova, *Bourgeau 1787* (MEXU, MO, P); Córdoba–Veracruz, 1 mi. off Hwy., above San Juan de Gracia, 750 m, *Croat 39611* (MO), *Miranda 4894* (MEXU), *Bourgeau s.n.* (K); El Mirador, 1,200 m, *Croat 44000* (B, MO, NY, WIS); Mun. Coatepec, 670 m, *Castillo & Tapia* (MO); Actopán, *Ortega-Ortiz 563* (F, XAL), *Ortega 556* (MO); Atoyac, *Rosas 1126* (F, XAL); Barra Platanar, *Dorantes et al. 1287* (MEXU); road to Jalapa, *Dorantes 505* (CAS, F, MEXU); SE of Jalapa, *Barkley et al. 2596* (MEXU, TEX); Cordillera, *Galeotti 6055* (BR); Cuichapa, *Rosas 910* (XAL); Huatusco, *Ghiesbreght 70* (P), *Moore & Bunting 8867, 8868* (CU); Ixhautlan, *Lot 869* (CAS, MEXU); Laivaparu, *Purpus 1400* (MICH); Minatitlán, 2 km N of Uxpanapa, 150 m, 17°13′N, 94°13′W, *Wendt et al. 4828* (MO); 13.7 km E of La Laguna, 130 m, 17°19′N, 94°22′W, *Wendt et al. 5809* (MO), *Gilly & Hernandez 253* (MICH); Orizaba, *Mueller 1335* (K, NY), *Botteri & Lumichrast 1602* (P), *Mueller 1314, 1335* (NY); Cerro de Nogales, 1,700 m, *Matuda 38590* (CAS); Río La Palma, Laguna de Sontecomapan, Catemaco, 0 m, 18°33′N, 95°00′W, *Menéndez 111* (MEXU, MO); Barra de Sontecomapan, *Hernandez 608* (MEXU); Mun. Tapalapa, 500 m, *Gomez-Pompa 5105* (MO); vic. of Playa Escondida, 10 km N of Sontecomapan, 1–50 m, *Nee 26699* (F, MO, XAL); Río Coatzacoalcos, *Williams 8940* (MICH, US); Nautla, *Fay & Calzada 925* (XAL); Rancho Viejo, *Purpus 15711* (UC); Zacualpan, *Purplus 1130* (MY, UC); San Andrés Tuxtla, *Dressler & Jones 8* (MICH, NY, UC), *Hernandez & Vásquez 552* (MEXU), *Moore & Cetto 6232* (BH, MEXU); Santiago Tuxtla, *Sousa 2158, 2373* (MEXU); Valle de Río Pescados, Techacastla, 1 km SSE of Jalcomuloco, 480 m, 19°21′N, 96°45′W, *Iltis et al. 28970* (MO, WIS). YUCATÁN: *Darwin & Sundell 2137* (MO); ca. 2 mi. S of Kalcetac at Actum Spukil, *Butterwick 88* (LL, MO, TEX); 11 km S of Xcalacoop, *Utley & Utley 6495* (MO); Mun. Dzemul, 15 km N of Dzemul, 5 m, *Davidse & Davidse 29469* (MO); Chichen Itza–Mérida, 25 mi. W of Chichen Itza, *Thompson 437* (MO), *Steere 1124* (MICH); Izamal, *Gaumer 741* (F, MO); S of Mérida, *Schott 638* (F); N of Muna, *Luteyn 2528* (DUKE). NICARAGUA. BOACO: Cerro Mombachito, 500–900 m, 12°24′N, 85°32′W, *Stevens 16318* (MO), *Stevens & Grijalva 14768* (MO). CHONTALES: N of Cuapa, Juigalpa–La Libertad, *Stevens 4030* (MO). ESTELÍ: N of Estelí, Kukamonga, 800–840 m, 13°14′N, 86°21′W, *Moreno 19936* (MO); 15.8 km N of entrance to Estelí, km 167 on Hwy. 1, 825–840 m, 13°15′N, 86°22′W, *Stevens 5786, 9095* (MO). RÍO SAN JUAN: Río Oyate–San Miguelito, 100 m, *Grijalva & Almanza 3581* (MO). ZELAYA: Kurinwacito, 80–100 m, 13°8′N, 84°55′W, *Moreno 23782* (MO); Siuna, Calera, 300–345 m, 13°46′N, 84°46′W, *Ortiz 1773* (MO); El Recreo, S of Siuna, *Neill 4226, 4521* (MO); Cerro Kana Coperna, 30 km E of Siuna, 250 m, *Neill 4527* (MO); Cerro La Calera, 4 km N of Siuna, 350 m, *Neill 4289* (MO); Cerro Waylawas, 100–268 m, 13°39′N, 84°48–49′W, *Pipoly 4199, 4300, 4360, 4361, 4372* (MO), *Stevens 737, 7383, 7386, 8736, 8753, 8755* (MO).

b. **Anthurium schlechtendalii** subsp. **jimenezii** (Matuda) Croat, Ann. Missouri Bot. Gard. 70(2): 377. 1983. Figures 279, 280.

Anthurium jimenezii Matuda, Anales Inst. Biol. Univ. Nac. Mexico 32: 147. 1962. TYPE: Mexico. Mexico: Barranca de Zacualpan, 1,300 m, *Matuda 37245* (holotype, MEXU).

Usually terrestrial or epilithic; stem less than 30 cm long, ca. 3–4 cm diam.; roots numerous, dense, ascending to descending, tan to greenish, usually smooth, short and thick, tapered, 5–10 mm diam.; cataphylls subcoriaceous, broadly lanceolate, 6–7 cm long, acute to obtuse and weakly apiculate at apex, light green tinged with red, drying brown, persisting ± intact at the upper nodes, eventually deciduous. *Leaves* erect-spreading; petioles 2–17 cm long, 8–10 mm diam., subquadrangular to trapezoidal, flattened to broadly and sharply sulcate adaxially, the margins somewhat raised, 2–3-ribbed abaxially, the surface minutely pale-speckled; geniculum paler and thicker than petiole, becoming fissured transversely with age, 1–2 cm long; blades moderately coriaceous, oblanceolate to oblong-oblanceolate, acute to acuminate at apex (the acumen apiculate), acute to obtuse to narrowly rounded at base, 36–104 cm long, 6–32 cm wide, broadest well above the middle, the margins undulate; both surfaces glossy to semiglossy, dark green above, paler, sometimes bluish green below; midrib above flat at base, becoming obtusely to acutely angular and then weakly sunken toward the apex, below prominently higher than broad and sharply 2-ribbed at base, becoming prominently and convexly raised toward the apex and paler than surface: primary lateral veins 9–14 per side, departing midrib at 50–70° angle, weakly arcuate-ascending, raised at the midrib, becoming sunken toward the margin above, prominently raised and darker than surface below, much more prominent than interprimary veins; interprimary veins weakly sunken above, prominulous below; tertiary veins weakly sunken above, weakly raised and darker than surface below; collective vein arising in the lower half or in the upper third of blade or absent, flat to weakly sunken above, prominulous below, 2–4 mm from margin. *Inflorescences* erect, shorter than leaves; peduncle 10–54 cm long, equalling or 2–3.4× as long as petiole, medium green weakly tinged reddish, terete; spathe spreading, subcoriaceous to moderately coriaceous, green weakly tinged with purple (B & K yellow-green 6/5), lanceolate, 4–8.5 cm long, 1–2.5 cm wide, broadest just above the base, inserted at 30° angle on peduncle, oblique and narrowly acuminate at apex (the acumen inrolled), subcordate at base; spadix greenish tinged with purple (B & K yellow-green 6/5), weakly and bluntly tapered, curved, 3.5–14 cm long, 5–17 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic to 4-lobed, 2.1–2.6 mm long, 2.7–2.9 mm wide, the sides straight to jaggedly sigmoid; 10–12 flowers visible in principal spiral, 6–8 in alternate spiral; tepals densely and minutely papillate, sparsely punctate, with numerous droplets at anthesis; lateral tepals 0.8–1.5 mm wide, the inner margins straight to very broadly convex, the outer margins 2–4-sided; pistils weakly emergent, medium green, darker than tepals; stigma oblong ellipsoid, 0.3–0.5 mm long; stamens emerging promptly in a regular sequence from the base, the laterals preceding the alternates by 6 spirals, the 3rd stamen preceding the 4th by 3 spirals, held just above tepals in a circle around the pistil; anthers conspicuously white to pale orange (B & K yellow 9/5), 0.7–0.8 mm long, 0.8–1 mm wide, inclined over the pistil; thecae oblong-ellipsoid to ovoid, 0.5 mm wide, slightly or not divaricate; pollen bright yellow fading to white. *Infructescence* pendent; berries red, oblong-ellipsoid, rounded at apex, 11 mm long, 9 mm diam.; mesocarp with numerous dense raphide cells; seeds 2 per berry, tan, oblong-ellipsoid, flattened, 6 mm long, 4 mm diam., 2 mm thick, with pale punctiform raphide cells, with a sticky, gelatinous apical appendage.

Anthurium schlechtendalii subsp. *jimenezii* is endemic to the Pacific slope of Mexico and is restricted to Guerrero, Oaxaca, and Chiapas in seasonally very dry forest ("selva baja caudicifolia" and "bosque del pino-encino") at 250 to 1,500(2,325) m.

Subspecies *jimenezii* is recognized by its exclusively terrestrial or epilithic habit, thick, oblanceolate leaf blades with usually free-ending primary lateral veins, purplish spadix, green, lanceolate spathe, and red berries.

This subspecies is geographically isolated from the typical subspecies of *A. schlechtendalii*, which is found in Veracruz and northern Oaxaca and also on the eastern side of the Isthmus of Tehuantepec, but not in western Oaxaca. Subspecies *jimenezii* differs from the typical subspecies in being generally smaller, occurring exclusively on rocks and in habitats seasonally much drier, and in having usually thicker leaf blades. Matuda (1961) stressed that the taxon has peduncles relatively much longer than those of *A. schlechtendalii*. While it is generally true that the inflorescences of subsp. *jimenezii* are commonly as long as or longer than the leaves, they may also be much shorter.

Subspecies *jimenezii* is also similar to *Anthurium halmoorei*, which differs in having an ovate to ovate-elliptic spathe and mature berries that are pale greenish yellow. Also similar is *A. nizandense*, which is endemic to southern Guerrero and southern Oaxaca. *Anthurium nizandense* differs in having proportionately much longer petioles and elliptic to oblong-elliptic blades that are matte on the lower surface. In *A. nizandense* the blades are 1.3–2.5 times longer than the petioles, whereas in *A. schlechtendalii* subsp. *jimenezii* they are usually 6–10 times longer (rarely only as little as 3 times longer).

MEXICO. CHIAPAS: Mpo. Ángel Albino Corzo, Finca Cuxtepec, 1,380 m, *Breedlove 50763* (MO); Mpo. Cintalapa de Figueroa, Colonia Francisco I. Madero–Colonia A. López Mateos, 560 m, *Breedlove 50560* (MO). GUERRERO: Acahuizotla–Agua de Obispo, *Moore 5120* (BH, UC); above Acahuizotla, *Moore 6957* (BH); Acapulco–Chilpancingo, *Moore 5099* (BH); Atoyac–Filo de Caballo, Nueva Deli, 1,300–1,500 m, 17°24′N, 100°17′W, *Miller & Tenorio 639* (MO); Cerreceras, *Hinton et al. 10098* (US); Km 39–Km 40, 3 mi. N of El Rincón, 15 mi. N of Tierra Colorada, Hwy. 95, 1,500 m, *Croat 45694* (CAS, F, K, M, MO, MEX, US); Malinaltenango, S of Zacualpán, *Matuda 37245* (MEXU); Milpillas–Atoyac de Alvárez, 3.7 mi. W of turnoff on road to Chichihualco, 2,325 m, *Croat 45621B* (MO); Motozintla–Huixtla, ca. 11 mi. S of Motozintla de Mendoza on Hwy. 211, 4,800 ft., *Utley & Utley 6813* (MO); Tierra Colorada, *Rodríguez 51* (US), *Rzedowski 22809* (MICH, US); Tierra Colorada–Agua de Obispo, El Ocotito, *Crisman & Willis 199* (MICH); Dtto. Mina, Trincheras, *Hinton 10125* (GH, K, US). OAXACA: La Galera, along Hwy. 175, 2.1 mi. N of turnoff to Pluma Hidalgo, 1,340 m, *Croat 46142* (K, MO); Oaxaca–Pochutla, 55.1 mi. S of Miahuatlán, 12.9 mi. S of Suchixtepic, Hwy. 175, 1,540 m, *Croat 46093* (MO); Oaxaca–Puerto Escondido, km 195, Santa Rosa, *Rzedowski 19592* (MEXU); Pinotepa Nacional–Tlaxiaco, 15.3 mi. N of Putla de Guerrero, 49 mi. S of Tlaxiaco, Hwy. 125, 1,480 m, *Croat 45926* (F, MO); Mpo. Matías Romero, 2.2 km SW of Pachiñe, 7.5 km SW of Mogone, on road to San Juan Guichicovi, 200–300 m, 16°58′N, 95°04′W, *Wendt et al. 4816* (MO).

Anthurium schottianum Croat & R. A. Baker, Brenesia 16(Suppl. 1): 83. 1979. TYPE: Costa Rica. Limón: ca. 1 mi. N of Bribrí, ca. 40 mi. SW of Limón, 50–100 m, *Croat 43247* (holotype, MO 2584489; isotypes CR, F, K, M, NY, SEL, US). Figures 281, 287.

Terrestrial, to 1 or more m tall; stem usually less than 50 cm long, 2.5–5 cm diam.; leaf scars conspicuous, 2–4 cm wide; roots few, descending, green, with flaky or scaly epidermis when dried, often short and blunt, ca. 5 mm diam.; cataphylls coriaceous, hooked, faintly 1-ribbed at apex, 9–12 cm long, apiculate at apex, dark purple to maroon (B & K purple 2/7.5), drying brown tinged with reddish purple, persisting intact or semi-intact, eventually deciduous. *Leaves* erect to spreading; petioles 40–150 cm long, 5–10 mm diam., stiff and firm, bluntly D-shaped to subterete, weakly and shallowly sulcate to flattened adaxially, rounded (sometimes with few faint ridges) abaxially, the surface green, sometimes with dark purple tinge spreading from the base; geniculum thicker and paler than petiole, 2–3 cm long; blades subcoriaceous, ovate, gradually acuminate at apex (the acumen downturned, long-apiculate), cordate at base, 44–100 cm long, 33–50 cm wide, broadest below or near the middle, the margins shallowly undulate, flat to revolute; anterior lobe 32–80 cm long, the posterior lobes 12–21 cm long, directed inward, rounded at apex; sinus usually narrowly triangular to closed, sometimes with overlapping lobes; upper surface matte to semiglossy, medium green, lower surface semiglossy, slightly paler; midrib above acutely raised at base, becoming sharply and narrowly raised toward the apex and paler than surface, below convexly raised at base, becoming sharply acute toward the apex; basal veins 5–9 pairs, not coalesced, sharply and narrowly raised above, less so below; primary lateral veins 9–20 per side, departing midrib at 35–50° angle, slightly arcuate-ascending, faintly loop-connecting, sharply raised above, less prominently and paler than surfaces below; interprimary veins few, narrowly raised above and below, paler than surface above; tertiary veins flat to weakly sunken above, somewhat raised below, paler than surface above and below; reticulate veins scarcely visible above, scarcely raised below, prominulous when dried on both surfaces; collective vein arising from 2nd basal vein, slightly sunken above, slightly raised below, obscure above when dried, slightly raised and paler than surface below, 2–6 mm from margin. *Inflorescences* erect, much shorter than leaves; peduncle sometimes absent or to 20 cm long, 4–5 mm diam., 0.2–0.4× as long as petiole, dark purple, terete; spathe spreading-reflexed to twisted, coriaceous, dark purple tinged with green (B & K red-purple 2/7.5), ovate-lanceolate, 6.5–15 cm long, 1.6–3.5 cm wide, broadest near base, inserted at 45° angle on peduncle, abruptly acuminate at apex (the acumen inrolled), rounded to subcordate at base, the margins meeting at 90–180° angle and stiffly rolled under; spadix deep red-violet to purple (B & K purple 2/7.5), cylindroid-tapered, 4–14 cm long, 7–9 mm diam. near base, 4–5 mm diam. near apex; flowers rhombic to square, 2.6–3 mm long, 1.5–3.5 mm wide, the sides ± straight; 4–6 flowers visible in principal spiral, 5–8 in alternate spiral; tepals matte, densely greenish punctate, minutely papillate; lateral tepals 1.9 mm wide, the inner margins straight to convex; pistils not emergent, rectangular, minutely and barely exposed and somewhat glossy, violet-purple (also reported as white); stigma slitlike; stamens emerging slowly from the base, in a regular progression, weakly exserted then retracting, grouped in a tight cluster above pistil; filaments flattened, translucent, 0.3–0.5 mm long, 0.6–0.7 mm wide; anthers yellow, 0.5–0.6 mm long, 0.7–0.9 mm wide, inclined over pistil; thecae ellipsoid, scarcely divaricate; pollen yellow (B & K yellow 9/5), sweet-scented; *Infructescence* with spathe usually persisting; spadix to 35 cm long, 2.5 cm diam., bearing berries in the basal portion only; berries pinkish with metallic sheen, darker in the apical third, obovoid, acute to rounded at apex, 9–10 mm long; pericarp thin; seeds 2 per berry, light brown, flattened, 6 mm long, 5 mm diam., 2 mm thick.

Anthurium schottianum is known only from a region of premontane wet forest-basal belt transition in extreme southwestern Costa Rica at less than 100 m. It will no doubt be found elsewhere in Costa Rica and Panama on the Atlantic slope.

This species is distinguished by its large, thin, ovate leaf blades with scarcely any posterior rib (i.e., all basal veins are free to the petiole), and by its short peduncle, purple spadix and ovate-lanceolate, often purplish, frequently twisted spathe. An unusual feature is the seasonal appearance of several inflorescences at the same time. The species has no known relatives.

COSTA RICA. LIMÓN: 1 mi. NE of Bribrí, 40 mi. SW of Limón, 50–100 m, *Croat 43247* (CR, F, K, M, MO, NY, RSA, SEL, US); Reserva Biológica Hitoy Cerere, Río Cerere to 1 km upstream from Quebrada Barrera, SW of Valle La Estrella, 90–200 m, 9°40.5′N, 83°2′W, *Grayum & Hammel 5764* (B, MO); Río Catarata, N of Bribrí, *Utley 5500* (DUKE); Río Sixaola, Bribrí–Caribbean coastal plain, 50–100 m, 9°37′N, 82°49′W, *Baker & Burger 69* (MO), *Burger et al. 10391* (F, MO), *10300* (MO).

Anthurium seibertii Croat & R. A. Baker, Brenesia 16(Suppl. 1): 85. 1979. TYPE: Panama. Chiriquí: wooded slopes on Cerro Horqueta, 1,650 m, *Croat 26976* (holotype, MO 2251853; isotypes, B, BM, CM, CR, F, GH, K, M, NY, PMA, RSA, US). Figures 282, 288, 291.

Epiphytic or epilithic or terrestrial; stem thick, short, 3–6 cm diam.; leaf scars mostly inconspicuous, ca. 2 cm wide; roots numerous, spreading to descending, pale green, pubescent, moderately thick and elongate, blunt, 3–6 mm diam.; cataphylls moderately coriaceous, lanceolate, prominently 1-ribbed near the apex, 12–21 cm long, acute at apex with subapical apiculum to 5 mm long, light green, drying tan (B & K yellow-red 8/5), persisting semi-intact, eventually deciduous. *Leaves* erect-spreading; petioles 10–55 cm long, 6–10 mm diam., stiff, firm, subquadrangular, flattened adaxially, the margins sometimes raised, 1–5-ribbed abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, becoming fissured transversely with age, 1.5–3 cm long; blades coriaceous to subcoriaceous, oblong-elliptic, gradually acuminate at apex (the acumen apiculate), acute to obtuse to narrowly rounded at base, 45–85 cm long, 4–16 cm wide, broadest at or near the middle, the margins flat to slightly undulate;

upper surface glossy to semiglossy, medium to dark green, lower surface matte to glossy, conspicuously paler; midrib convexly raised above, paler than surface, sharply and obtusely raised below, slightly paler than surface; primary lateral veins many per side, departing midrib at 50–60° angle, arcuate-ascending, prominently loop-connecting, prominently sunken above, raised and darker than surface below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins obscure above, weakly visible below; reticulate veins obscure above, mostly obscure below, drying partly prominulous on both surfaces; collective vein arising from near the base, equally as prominent as primary lateral veins, sunken above, raised and darker than surface below, 2–7 mm from margin. *Inflorescences* erect to spreading, shorter than leaves, 1–5 per plant; peduncle 30–60 cm long, 6–10 mm diam.; 1.5–3 × as long as petioles, green, sometimes tinged with purple, terete with single dorsal rib; spathe reflexed, often becoming recurled, subcoriaceous, plain green or tinged with purple (B & K yellow-green 7/10), oblong-lanceolate, 10–17 cm long, 2.5–4.3 cm wide, broadest near the base, inserted at 50° angle on peduncle, gradually and narrowly long-acuminate at apex, rarely short-acuminate (the acumen inrolled), rounded (scarcely decurrent) at base, the margins meeting at ca. 140° angle; stipe 13 mm long in front, 1 mm long in back; spadix violet-purple (B & K blue-purple 2/10), cylindroid-tapered, 10–20 cm long, 7–13 mm diam. near base, 5–6 mm diam. near apex; flowers 4-lobed at apex, 2–2.5 mm in both directions, the sides jaggedly sigmoid; 7–10 flowers visible in either spiral; tepals matte; lateral tepals ca. 1.5 mm wide, the inner margins straight; pistils rectangular, orange-yellow; stigma rectangular, ca. 0.7 mm long, droplets persisting for several days before stamens emerge; stamens emerging ± rapidly from the base, held just above tepals at anthesis; filaments not exposed; anthers pale orange, ca. 0.5 mm long, 1 mm wide; thecae ellipsoid, scarcely divaricate; pollen white. *Infructescence* pendent; spathe often deciduous; spadix 22–30 cm long, ca. 2 cm diam.; berries orange, obovoid, flat to rounded at apex, 10–12 mm long; mesocarp mealy, orange, sweet-tasting but pungent; seeds 2 per berry, ± oblong with rounded corners, ca. 5 mm long, 4 mm diam., 2 mm thick.

Anthurium seibertii ranges from central Costa Rica to western Panama at 1,000 to 3,000 m in premontane wet, lower montane wet, and lower montane rain forest life zones.

This species is characterized by its oblong-elliptic leaf blades, subquadrangular petioles, violet-purple spadix, and orange berries.

Anthurium seibertii is very similar to *A. protensum*. These species share similar strap-shaped leaves, purple spadices, and orange berries. *Anthurium protensum* differs in having a nearly terete petiole, while *A. seibertii* has petioles that are quadrangular in cross section and prominently ribbed abaxially. Leaves of *Anthurium protensum* are also usually pendent and generally smaller than those of *A. seibertii*.

COSTA RICA. ALAJUELA: San Carlos, 1,375 m, *Smith 1498* (NY). LIMÓN: Cerro Pittier, Valle de Silencio, 6,000–6,500 ft., *Antonio 1675* (cultivated at MO). PUNTARENAS: Cantón de Coto Brus, cultivated at Las Cruces Tropical Botanical Garden, 6 km W of San Vito de Java, 1,200 m, *Croat 57259* (MO); Cerro Burú, upper slopes, 2,000–2,300 m, 9°0′N, 82°49′W, *Davidse et al. 23789, 23790, 23791, 23831* (MO); Cordillera de Talamanca, Cerro Frantzius–Cerro Pittier, Río Canasta, 9.4 air km NW of Agua Caliente, 1,500–1,600 m, 9°2′N, 82°59′W, *Davidse et al. 28395* (MO); Cerro Frantzius to Valle de Silencio, 2,000–2,500 m, 9°3–6′N, 82°58–59′W, *Davidse et al. 28565* (CR, MO); headwaters of Río Bella Vista–Sitio Cotón on Río Cotón, 1,800-2,200 m, 9°49–57′N, 82°46–49′W, *Davidse et al. 25535* (MO); Tres Colinas, 1,800–1,850 m, 9°7′N, 83°4′W, *Davidse et al. 25602* (K, MO, RSA), *25613* (CR, K, MO), *25636* (B, MO); Tres Colinas–Cerro Bekom, 2,300 m, 9°7–10′N, 83°4′W, *Davidse & Herrera 26179, 26183* (CR, MO); Sitio Coto Brus, 1,800–1,900 m, 8°59′N, 82°46′W, *Davidse 24528, 24534* (MO); Monteverde Reserve, 11°20′N, 84°40′W, *Hepper 110* (BM); Río Burú, upper part, 2,010 m, *Gómez et al. 21800* (CR, MO); Río Cotoncito, Las Tablas, Zona Protectora, *Chacón et al. 1768* (DUKE, MO, RSA). SAN JOSÉ: Sierra–San Cristóbal Sur, 1–2 km from Sierra, 1,900 m, *Utley & Utley 3059* (MO); El General, 1,040 m, *Skutch 2626* (F, MO). PANAMA. CHIRIQUÍ: 1.5 mi. W of Cerro Punta, 1,700 m, *McDaniel 10161* (IBE); Bambito, 2,000 m, *Correa & Lazor 1407* (PMA); Bambito–Cerro Punta, *Croat 10555* (MO); Cerro Punta–Quebrada Iglesia, *Croat & Porter 16063* (M, MO, RSA, U, VEN); 3.7 km E of bridge NE of Cerro Punta, on road through Bajo Grande, 2,250–2,400 m, 8°50′N, 82°32′W, *Stevens 18226* (MO, PMA); Volcán, *Antonio 1059* (MO); 3.5 km NE of Boquete, end of road along Río Palo Alto, *Hammel 5667* (MO); Barú Summit, W end of high ridge W of summit, 3,000 m, *Hammel et al. 6916* (MO); Boquete Region, Quiel Road, 10 km above Boquete, 1,830 m, *Proctor 31816* (LL); Bajo Mono, Quebrada Chiquero, 1,500 m, *Woodson & Schery 599* (MO); Palo Alto, E of Boquete, 1,670 m, *Stern et al. 1076* (MO); Boquete, Monte Rey, *Croat 15743* (MO, NY), *15844* (MO), *Woodson & Schery 265* (MO); Boquete, La Popa, 1,500–2,500 m, *D'Arcy 10853* (MO); Boquete, *Folsom 2194* (MO); Cerro Horqueta, 1,500–1,830 m, *Croat 26976* (B, CM, CR, F, GH, K, M, MO, NY, PMA, RSA, US), *Dwyer 8749* (MO, DUKE); 1,870–2,470 m, *Averett et al. 1084* (MO); NW of Boquete, 1,670–1,930 m, *Burch 553* (MO); above Boquete, on E slope above Quebrada Horqueta, 1,660–1,700 m, 8°49′N, 82°29′W, *Cochrane et al. 6243* (MO, WIS); Cerro La Trompeta, Palo Alto, 4.5 mi. NE of Boquete, 2,070 m, *Hammel 7464* (MO); Cerro Pate Macho, 1,630–

1,780 m, 8°46'N, 82°25'W *Croat 66358* (MO); headwaters of Río Palo Alto, above Palo Alto, 1,700–2,100 m, 8°47'N, 82°22'W, *Knapp & Schmalzel 4794* (MO, USM); N fork of Río Palo Alto–Cerro Pate Macho, 6 km NE of Boquete, 1,500–1,700 m, *Grayum et al. 6361* (CM, MO, NY), *Stein et al. 1183* (MO); Cerro Punta, Raul Castro's house, Guadalupe, 2,000–2,330 m, *Folsom 6034, 6035* (MO); 0.5 mi. SE of Entre Ríos, 1 mi. by road from Cerro Punta, 2,000 m, *Croat 48568* (K, MO, PMA, SEL); 2.2 mi. below Cerro Punta, W side of Volcán Chiriquí, 200 m, *Luteyn 902* (MO); Alto los Guerra, road W of Bambito, 1,800–2,000 m, 8°53'N, 82°37'W, *Hamilton & Krager 3894* (B, K, MO); E of Bajo Choro, N slope of Barú, 2,000–2,170 m, *Hammel 2994* (MO); Quebrada Bambito, S of Cerro Punta, *Lazor 2727* (MO); Las Cumbres, W of Cerro Punta, 2,470 m, *D'Arcy et al. 13196* (MO); Casita Alta, Volcán de Chiriquí, 1,500–2,000 m, *Woodson et al. 882, 982* (MO); Bambito–Cerro Punta, Volcán de Chiriquí, *Croat 10551* (MO); Las Nubes, 2,000 m, *Croat 26427* (MO, SEL), *Croat 26494* (B, CAS, CM, DUKE, K, MO); N of Audubon cabin, *Croat 13618* (MO); along road to Cerro Punta, 8 km NW of Boquete, 5.5 km NW of Alto Quiel, 1,600 m, *Nee 9945* (MO); E of Cerro Punta, road to Paseo Respingo, 2,330 m, *Hammel et al. 6623* (MO); Río Caldera, Bajo Mono, NW of Boquete, 2,130 m, *D'Arcy et al. 12761* (MO); Río Chiriquí Viejo, upper part, Monte Lirio, 1,300–2,000 m, *Allen 1506* (MO), *Seibert 172* (MO, NY), *Seibert 289* (MO); Dtto. Boquete, Bajo Chorro, *Davidson 225, 276* (MO); Dtto. Bugaba, Cerro Pando, Santa Clara, Hartman's finca, 1,300 m, 8°50'N, 82°44'W, *van der Werff & Herrera 7126* (B, MO), *7303* (MO, RSA).

Anthurium selloum K. Koch, Ind. Sem. Hort. Berol. App. 8. 1855. TYPE: St. Johns, Virgin Islands, *Krebs s.n.* (lectotype, C). Figures 193A, 289.

Pothos macrophylla Sw., Prodr. 33: 1788; Fl. Ind. Occ. 3: 269. 1806. TYPE: Jamaica? Not seen.
Anthurium macrophyllum (Sw.) Schott (1829) non D. Don in Sweet (1839) nec Endl. ex Griseb. (1864), Prodr. Aroid. 516. 1860.

Description based on dried material only. Epilithic; stem and cataphylls unknown. *Leaves* with petioles ca. 34–45 cm long, ca. 7 mm diam., mostly spreading, apparently D-shaped, slightly flattened laterally, sulcate adaxially, with the margins acutely raised, rounded abaxially; geniculum thicker and paler than petiole, 1–1.5 cm long; sheath 4 cm long; blades subcoriaceous, oblong-ovate, somewhat triangular, acute to weakly and shortly acuminate at apex (the acumen ca. 10 mm long), broadly and shallowly cordate at base, 36–46 cm long, 14–19 cm wide, broadest in the basal third, the margins conspicuously and broadly undulate; apex of posterior lobes rounded; sinus parabolic-arcuate, 3 cm deep; both surfaces weakly glossy, yellowish brown and greenish in part; midrib apparently convexly raised above and below; major veins convexly raised, paler than surface and yellowish above and below; basal veins 3–4 pairs, 2nd & 3rd to 4th coalesced for up to 1.3 cm; primary lateral veins 3–5 per side, departing midrib at 25–45° angle, mostly straight, sometimes arcuate to the margin; interprimary veins sometimes present, ranging from not as conspicuous as to almost as conspicuous as primary lateral veins; tertiary veins conspicuous above and below; reticulate veins obscure above, weakly visible below; collective vein arising from uppermost ½ or ⅓ of the blade, less prominent than primary lateral veins, to 11 mm from margin. *Inflorescences* apparently ± spreading; peduncle 39–73 cm long, 2–4 mm diam., 1.1–2.1 × as long as petiole, pale green, subterete; spathe semi-erect to reflexed, thinly coriaceous, pale green, oblong-lanceolate, 7.5–13.5 cm long, 0.8–1.4 cm wide, broadest near the base, inserted at 40–50° angle on peduncle, narrowly acuminate to caudate at apex (the acumen 10–20 mm long), acute to obtuse at base; spadix dark maroon purple to brownish purple, long-tapered, sessile, held at 150–170° angle from peduncle, 14–27 cm long, 6–8 mm diam. near base, 2–3 mm diam. near apex, broadest near the base; flowers rhombic, 1.6–2.4 mm long, 1.7–2.8 mm wide, the sides jaggedly to smoothly sigmoid; 7–8 flowers visible in principal spiral, 4–6 in alternate spiral; tepals roughened, lateral tepals 1.1–1.5 mm wide, the inner margins usually broadly convex, sometimes straight, the outer margins 2-sided; stigma broadly ellipsoid, 0.4–0.6 mm long, densely brush-like; filaments apparently flattened, 0.4–0.5 mm long, 0.5–0.7 mm wide; anthers yellow, 0.5–0.6 mm long, 0.4–0.5 mm wide; thecae oblong, not divaricate. *Infructescence* not seen.

Anthurium selloum is endemic to the West Indies, known only by a few collections from elevations of 300 m or less, on two of the U.S. and British Virgin Islands (St. John and Tortola, respectively).

This species is distinguished by its somewhat triangular, shallowly cordate leaf blades broadest in the lower third and with 3–4 pairs of basal veins, and by the long-tapered, dark maroon-purple spadix. It is unlikely to be confused with any other species in the West Indies, or anywhere else.

Engler (1905) questionably placed *Pothos macrophylla* Sw. in synonymy with *A. selloum*, perhaps based on Schott's (1860) placement of *A. selloum* in synonymy with *A. macrophyllum* Schott.

BRITISH VIRGIN ISLANDS. TORTOLA: High Bush, 75 m, *Britton & Shafer 714* (NY, US). U.S. VIRGIN ISLANDS. ST JOHN: *Raunkiaer 2669* (C); Bordeaux, 300 m, *Britton*

& *Shafer 560* (NY, US), *Krebs s.n.* (C). WEST INDIES. WITHOUT LOCALITY: *Martens s.n.* (BR), *Brown s.n.* (K).

Anthurium simpsonii Croat, sp. nov. TYPE: Peru. Tumbes: Dtto. Matapalo, road to Campo Verde, *Simpson & Schunke 392* (holotype, F 1771582). Figure 290.

Planta epiphytica; internodia ca. 1.5 cm diam.; cataphyllum persistens velis fibrarum reticularum; petiolus 6 cm longus, ca. 6 mm diam., D-formatus; lamina oblongo-oblanceolata, 66 cm longa, 8.5 cm lata; pedunculus 23–25 cm longus; spatha oblanceolata, ca. 5 cm longa, ca. 8 mm lata; spadix purpureus, cylindricus, ca. 5 mm diam.

Description based on dried material only. Epiphytic; stem ca. 1.5 cm diam.; roots numerous, dense, gray-brown and shortly woolly-pubescent, moderately thick and elongate, somewhat tapered at apex, 3–5 mm diam.; cataphylls subcoriaceous, 11.5–12 cm long, acuminate at apex, tan, persisting intact, eventually as a reticulum of fibers. *Leaves* erect or somewhat spreading; petioles 6 cm long, ca. 6 mm diam., D-shaped, probably flattened adaxially, rounded or multi-ribbed abaxially; geniculum slightly darker than petiole, ca. 1 cm long; blades subcoriaceous, oblong-oblanceolate, acute at apex (the acumen apiculate), acute at base, 66 cm long, 8.5 cm wide, broadest at or above the middle; upper surface glossy, lower surface semiglossy; both surfaces matte, grayish green; midrib flat to convexly raised above, concolorous with the surface, prominently and convexly raised below, paler than surface; primary lateral veins ca. 22 per side, departing midrib at 50–60° angle, ± straight to the collective vein, raised above and below, slightly paler than surface below; interprimary veins prominulous below; reticulate veins visible below; collective vein arising from near the base, raised above and below, less prominent than primary lateral veins, 1–3 mm from margin. *Inflorescences* with peduncle 23–25 cm long, ca. 3 mm diam., ca. 5 × as long as petioles, terete; spathe, yellowish brown, oblanceolate, ca. 5 cm long, 0.8 cm wide, acute at base, the margins meeting at an acute angle; stipe 7 mm long in front, 3 mm long in back; spadix purplish, cylindroid, erect, ca. 5 mm diam.; flowers ± square; 5–7 flowers visible in principal spiral, 7–9 in alternate spiral; tepals deep purple with light tips; lateral tepals 0.9–1.2 mm wide, the inner margins straight, the outer margins 2-sided; pistils glossy, wine-red; stigma probably slitlike; anthers 0.4 mm long, 0.4–0.5 mm wide; thecae oblong, 0.2 mm wide, slightly or not at all divaricate. *Infructescence* with spathe persistent; spadix 12.5 cm long, 1.8 cm diam.; berries purple, ovoid, acute at apex, 6.5 mm long, 5.5 mm diam.; mesocarp translucent, gelatinous, orange; seeds 2 per berry, yellow-brown, flattened, 3.5–3.7 mm long, 2.7 mm diam., 0.9–1 mm thick, enveloped by gelatinous, translucent substance.

Anthurium simpsonii is known only from the type collection from the Department of Tumbes in northern coastal Peru, at 600 to 800 m in the subtropical dry forest life zone.

This species is characterized by its small size, very short petioles, and oblong-oblanceolate blades with collective veins arising from near the base, as well as by the long, rather slender spadix, deep purple flowers, and wine-red fruits. It is not likely to be confused with any other species. The only other species of sect. *Pachyneurium* that occurs in this part of Peru is *Anthurium barclayanum*, a much larger plant with leaves drying dark brown (not grayish) and collective veins arising from near the apex.

The new species is named in honor of Donald Simpson, formerly of the Field Museum of Natural History (F), who collected the type when he headed the Flora of Peru Project.

PERU. TUMBES: Prov. Zarumilla, Dtto. Matapalo, Bosque National de Tumbes, Campo Verde, 600–800 m, *Simpson & Schunke 392* (F).

Anthurium solitarium (Vell. Conc.) Schott, Prodr. Aroid. 478. 1860. Figures 292, 293, 295.

Pothos solitarius Vell. Conc., Fl. Flum. 9: t. 123. 1825 [1829]. TYPE: Brazil. Rio de Janeiro. (The plate cited above serves as the type.)

Anthurium glaziovii Hook. f., Bot. Mag. t. 6833. 1885. TYPE: Brazil. Rio de Janeiro, *Glaziou 17333* (holotype, B, photo seen; isotype, K).

Anthurium nobile Engl., Bot. Jahrb. Syst. 25: 366. 1898. TYPE: Brazil. Rio de Janeiro, *Glaziou 9039* (holotype, B; MO, photo).

Epiphytic or epilithic; stem 1.5–4 cm diam.; roots descending, velutinous, appearing inflated or with air spaces inside when dried, sharply tapered at apex, 2–9 cm long, 3–10 mm diam.; cataphylls lanceolate, 6–11 cm long, acuminate at apex with subapical apiculum to 5 mm long, drying brown, persisting semi-intact at apex and eventually weathering into coarse, linear fibers. *Leaves* erect-spreading; petioles (2)6–28(32) cm long, 5–9 mm diam., spreading, C-shaped to thicker than broad, narrowly and deeply sulcate with obtuse to acute margins adaxially, rounded abaxially, the surface dark green, pale-speckled; geniculum slightly thicker and paler than petiole, 1–1.5 cm long; sheath 2.5–4 cm long; blades subcoriaceous to coriaceous, obovate to oblanceolate, often somewhat elliptic, short-acuminate to acute and apiculate at apex, obtuse to semi-rounded or weakly subcordate at base, 26–70(80) cm long, (6)10–23(27) cm wide, broadest at or near the middle, the margins weakly and broadly undulate; upper surface semiglossy, medium green, lower surface weakly glossy, paler below; both surfaces drying matte to semiglossy, yellowish brown; midrib flat to obtusely raised or obtusely sulcate at base, becoming convexly raised, sometimes sharply acute toward the apex above, obtusely to acutely raised, sometimes faintly 1–3-ribbed at base below; primary lateral veins 5–12 per side, departing midrib at (25)40–60(70)° angle, ± straight, becoming arcuate near margin, raised in grooves or weakly to prominently raised on upper surface, prominently raised and stout below, paler than surface; interprimary veins weakly raised above and below when visible, darker below; tertiary veins prominulous, weakly raised to weakly sunken above, moderately visible or obscure above, very weakly raised below; collective vein arising from near the apex or absent, if present sunken above, raised below, 10–20 mm from margin. *Inflorescences* erect or erect-spreading, or somewhat pendent; peduncle (15)30–102 cm long, 3–5 mm diam., 1.3–16× as long as petiole, green sometimes tinged with purple, terete, pale- to dark-speckled; spathe spreading, coriaceous, green tinged with purple adaxially, oblong to lanceolate, 6–25 cm long, 1.5–2 cm wide, broadest near the base, acuminate at apex (the acumen inrolled, 5–10 mm long), obtuse to acute at base, often decurrent; spadix dark maroon or purple, mostly subsessile (rarely stipitate to 30 mm), tapered, curved, 12–33 cm long, 4–14 mm diam. at base, 3–7 mm diam. at apex, broadest at the base; flowers rhombic, 1.8–3.6 mm long, 1.2–2.6 mm wide, the sides ± straight to sigmoid; 6–10 flowers visible in principal spiral, (6)10–12 in alternate spiral; tepals matte; lateral tepals 1–1.6 mm wide, the inner margins broadly convex, the outer margins 2-sided; pistils not emergent; stigma linear becoming ellipsoid, possibly becoming circular, sometimes appearing somewhat caviform when dried, 0.4–0.7 mm long; stamens emerging in a regular sequence; the laterals preceding the alternates by 13–20 spirals, held at edge of the tepals, inclined over and obscuring the pistil; filaments not exserted; anthers 0.4–0.5 mm long, 0.8–0.9 mm wide; thecae ovoid, 0.3–0.4 mm wide, slightly divaricate; pollen golden. *Infructescence* with spathe persisting; spadix 19–40 cm long, 11–18 mm diam.; berries purple-red, more or less oblong, the basal tepalar fibers strongly adherent, 5–6 mm long, 2–3 mm diam.; pericarp with raphide cells; mesocarp ± dry; seeds 1–2 per berry, covered with raphides, ellipsoid, 4–4.4 mm long, 1.8–2 mm diam., 0.8–1 mm thick, with a gelatinous appendage.

Anthurium solitarium is known from the states of Espírito Santo, Goiás, Minas Gerais, and Rio de Janeiro in Brazil from 300 to 1,300 m, where it is epiphytic or epilithic in mainly primary forest habitats.

This species is recognized by its thickly coriaceous, obovate or oblanceolate blades, with the primary lateral veins running straight from the midrib to the margin, and then steeply and arcuately rising along the margin. Also distinctive is the maroon to purple spadix and prominently decurrent spathe.

Anthurium solitarium is not easily confused with any other Brazilian species or with species from other areas.

Several collections are noteworthy. *Glaziou 9039*, the type of *Anthurium nobile* (here synonymized), is unusual in having a prominently stipitate (nearly 3.5 cm) spadix, instead of the more common sessile to weakly stipitate condition. *Croat 53794*, a sterile collection from cultivation, may possibly represent a distinct species. It differs in having a thicker blade with less conspicuous tertiary veins, as well as having the primary lateral veins and the midrib drying pale and wrinkled. *Croat 53699*, also of cultivated origin, is unusual in having a collective vein arising from one of the primary lateral veins almost at the middle of the blade. Generally, the collective vein of *A. solitarium* is lacking or strictly apical.

BRAZIL. BAHIA: Santa Cruz de Cabrália (cultivated at Sitio Burle-Marx), 16°18'S, 39°01'W, *Harley et al. 20316* (K). ESPÍRITO SANTO: Domingos Martins, property of Roberto Kautsky, *Croat 57165* (cultivated) (MO), *61808* (MO, R), *61817* (MO, R); Domingos Martins–Santa Maria Jetibá, 31 km N of Domingos Martin, ca. 0°20'S, 40°40'W, *Croat 61893* (MO, R); 0.8 km N of town, 525 m, 20°22'S, 40°40'W, *Croat 61798* (MO, R); Colatina–Vitoria, 45 km E of Colatina, *Belem 3833* (NY), *Croat 61894* (MO, R); Domingos Martins–Santa Maria, 845 m, *Plummer 194* (cultivated at Kew, #275-79-02469) (K). GOIÁS: 12 km S of Caiaponia, *Hutchison 8505* (MO). MINAS GERAIS: Paraibuna, *Heringer 7660* (RB, UB); 17 km E of Cambuquira, Hwy. 267 to Caxambu, 950 m, *Davidse & Ramamoorthy 10670* (MO); north of Caxambu, *Clayton 9/22/1951* (NY). RIO DE JANEIRO: *Glaziou 9039* (B), *17333* (K); cultivated by Burle-Marx, San Carlos, *Croat 53699* (MO, NY, RB), *53708, 53711, 53712, 53713* (MO, RB); Cultivated by Luis Gurken, San Carlos, *Croat 53794, 53792* (MO); Friborgo, 1,000 m *Croat 53793* (MO); Serra da Carioca, Rio de Janeiro, Macico da Tijuca, 300 m, *Croat 53670* (MO); Serra dos Orgãos, *Luetzelburg 6061* (RB); E of Rio Maio, Teresopolis, *Vidal 953*

(RB); Neves Armond, Carmo, *RB 43978* (RB); Mpo. Petropolis, Rodovia Washington Luis, 420 m, *Martinelli 3080* (RB); Reserva do IBDF, Mata do Facão, estrada Fazenda Inglesa para Pati do Alferes, 1,100–1,200 m, *Cavalcante & Marinelli 541* (K); Mpo. de Santo Antônio de Pádua, BR 393, *Pirani et al. 268* (K, MO, SPF); Mpo. Teresopolis, Parque Nacional da Serra dos Orgãos, 1,300 m, *Vidal 5557* (R).

Anthurium solomonii Croat, sp. nov. TYPE: Bolivia. La Paz: Prov. Yungas: 32.1 km N of Yolosa on road to Caranavi, *Solomon & Escobar 12494* (holotype, MO 32475329-30; isotype, LPB). Figures 296, 345, 346.

Planta epilithica aut terrestris; internodia brevia, ad 5 cm diam.; cataphyllum ad 19 cm longum, persistens semiintactum demum fibris linearis findens; petiolus 7–21 cm longus, 8–10 mm diam., D-formatus, 1-costatus adaxile, 1–2-costatus abaxile; lamina oblanceolata ad oblongo-oblanceolata, (39)65–94 cm longa, (9)18–35 cm lata; pedunculus (4)10–26 cm longus, ca. 5 mm diam.; spatha lanceolata, utra 6 cm longa, ca. 1.7 cm lata; spadix longeus contractus vel cylindricus, 7.5–19.5 cm longus, 9 mm diam.; baccae laete roseo-purpureae.

Description based on dried material only. Epilithic or terrestrial; stem to 5 cm diam.; roots numerous, gray, finely pubescent, short, 2–4 mm diam.; cataphylls probably subcoriaceous, to more than 19 cm long, brown-gray, persisting semi-intact, eventually as fine linear fibers. *Leaves* with petioles 7–21 cm long, 8–10 mm diam., D-shaped, with an obtuse medial rib and acute, somewhat raised margins adaxially, 1–3-ribbed abaxially; geniculum drying darker than petiole, 0.7–1 cm long; sheath 6 cm long; blades subcoriaceous, oblanceolate to oblong-oblanceolate, acute at apex (the acumen apiculate), narrowly rounded at base, (39)65–94 cm long, (9)18–35 cm wide, broadest above the middle, the margins undulate; both surfaces glossy, matte to glossy, brown to greenish; midrib sharply and prominently acute above, below higher than broad and obscurely 3-ribbed at base, becoming convexly raised toward the apex; primary lateral veins (10)15–19 per side, departing midrib at 40–90° angle, straight, sometimes broadly arcuate, convexly raised on both surfaces; interprimary veins few; tertiary veins raised above and below; reticulate veins raised below; collective vein arising from lower third of the blade or absent in young plants, less prominent than primary lateral veins on both surfaces, 2–7 mm from margin. *Inflorescences* shorter than leaves; peduncle (4)10–26 cm long, ca. 5 mm diam., 0.5–2× as long as petiole; spathe subcoriaceous, presumably lanceolate, more than 6 cm long, ca. 1.7 cm wide, decurrent at base; stipe ca. 2.7 cm long in front, 4 mm long in back; spadix color unknown, long-tapered to ± cylindroid in small plants, weakly curved, held at 160° angle from peduncle, 7.5–19.5 cm long, 9 mm diam. near base, 4 mm diam. near apex; flowers rhombic, 2.1–2.4 mm long, 1.4–1.7 mm wide, the sides straight to smoothly sigmoid; 9–11 flowers visible in principal spiral, 5–6 in alternate spiral; tepals roughened; lateral tepals 0.9–1.5 mm wide, the inner margins straight to broadly convex, the outer margins 2-sided; stigma linear, 0.5–0.7 mm long; anthers pale yellow, 0.5–0.6 mm long, 0.7–0.8 mm wide, obscuring the pistil; thecae oblong, slightly divaricate. *Infructescence* appearing to be ± erect; spathe deciduous; spadix ca. 21 cm long, 2 cm diam., reddish brown (excluding tepals); berries bright pinkish purple, oblong-ovoid, probably acute and with radial ridges at apex, becoming sunken in on drying, 7.5–8 mm long, 4.6–5 mm diam.; pericarp thickened, with numerous raphide cells; seeds 2 per berry, reddish brown, ± ovoid, flattened, 3.4–3.6 mm long, 2.2–2.4 mm diam., 0.8–1 mm thick, with a gelatinous, translucent, amber appendage at each end.

Anthurium solomonii is known only from La Paz Dept. in Bolivia at 1,000 to 1,400 m in wet subtropical or wet lower montane subtropical forest life zones (according to the Holdridge Life Zone Map for Bolivia).

This species is distinctive, with its spadix longer than the peduncle, a character otherwise known in the section only in *Anthurium plowmanii*. The petiole of *A. plowmanii* is narrowly sulcate adaxially with blunt margins, whereas in *A. solomonii* there is a prominent medial rib adaxially and prominently raised, acute margins. In Bolivia, *A. plowmanii* is known only from Pando and Santa Cruz departments and occurs at less than 900 m, mostly less than 300 m.

The species is named in honor of James Solomon, who has collected extensively in Bolivia and was involved in making all known collections of *A. solomonii*.

BOLIVIA. LA PAZ: Prov. Murillo. Valle de Zongo, 45 km below the dam at Lago Zongo, Cahua hydroelectric plant, 1,200–1,400 m, 16°3'S, 68°1'W, *Solomon 13000* (MO); Prov. Nor Yungas, Yolosa–Caranavi, 32.1 km N of Yolosa, 1,000 m, 16°2'S, 67°39'W, *Solomon & Escobar 12494* (LPB, MO); 10 km by road N and above Caranavi, 1,400 m, 15°47'S, 67°32'W, *Nee & Solomon 30311* (NY).

Anthurium soukupii Croat, sp. nov. TYPE: Peru. Cuzco: Urubamba, Machupicchu, 0.5 km N of the union of Río Sayacmarca and Río Aobamba, 2,370 m, *Peyton & Peyton 1486* (holotype, MO 3024625-6). Figures 294, 297, 298.

Planta terrestris; caulis elongatus, ad 50 cm longus; internodia 1.5–2.5 cm diam.; cataphyllum lanceolatum, persistens in fibris linearis; petiolus 6.5–11 cm longus, ca. 5–7 mm diam., triangularis; lamina late ad anguste oblanceolato-elliptica, (22.5)28–63 cm longa, (3.8)4.7–10 cm lata; pedunculus 22–40 cm longus, 2–4 mm diam.; spatha lanceolata, 4.5–8 cm longa, 7–14 mm lata; spadix atropurpureus leviter contractus, 3.5–6 cm longus, ca. 4–5 mm diam.; baccae globosae, 3.2–4 mm longae.

Terrestrial; stem elongate, to 50 cm long, 1.5–2.5 cm diam.; roots moderately numerous, dense, white, smooth, thick, ± elongate; cataphylls lanceolate, probably subcoriaceous, to 11 cm long, acute at apex, drying yellowish tan, persisting as fine linear fibers. *Leaves* spreading; petioles 6.5–11 cm long, ca. 5–7 mm diam., triangular, flattened adaxially with the margins moderately to sharply raised, sides weakly convex, obtusely rounded to acutely angular abaxially; geniculum not at all or only slightly thicker than petiole when dried, 0.7–1 cm long; blades coriaceous, broadly to narrowly oblanceolate-elliptic, acute at apex, acute to obtuse at base, (22.5)28–63 cm long, (3.8)4.7–10.7 cm wide, broadest above the middle, the margins straight to weakly undulate; upper surface semiglossy, medium green, paler below; both surfaces drying matte, occasionally semiglossy below, green to yellowish; midrib convex- to round-raised above, sharply acute below; primary lateral veins numerous, to more than 20 per side, departing midrib at 50–65° angle, ± straight, obscure to raised and darker than surface above, flat to weakly raised below; interprimary veins numerous, almost as conspicuous as primary lateral veins on both surfaces; tertiary veins not visible on either surface; collective vein arising from near the base, sometimes in the upper third of the blade, equally as prominent as primary lateral veins on both surfaces when dried, 3–12 mm from margin. *Inflorescences* erect to spreading; peduncle 22–40 cm long, 2–4 mm diam., 2.6–4.2× as long as petiole, apparently ribbed abaxially; spathe reflexed, subcoriaceous, green, lanceolate, 4.5–8 cm long, 0.7–1.4 cm wide, broadest near the base, acuminate at apex, acute at base; stipe to 1 cm long in front, to 3 mm long in back; spadix dark purple, weakly tapered, stipitate to sessile, ca. 3.5–6 cm long, ca. 4–5 mm diam. near base; flowers ± square 3.1–4.3 mm in both directions, the sides straight to smoothly sigmoid; 5–6 flowers visible in principal spiral, 6–7 in alternate spiral; lateral tepals 2.3–3 mm wide, the inner margins straight, slightly turned up against the pistil, the outer margins 2-sided; pistils drying blackened, emergent well above the tepals, green; stigma linear, 0.5–0.6 mm long; anthers pinkish, ca. 0.8 mm long, 1 mm wide; thecae ovoid, slightly divaricate. *Infructescence* with spathe absent; spadix 3–13.5 cm long, 0.8–1 cm diam.; berries globose, rounded at apex, 3.2–4 mm long, 3.7–4.5 mm diam.; pericarp thickened, with numerous pale raphide cells; mesocarp translucent, gelatinous; seeds 2 per berry, reddish brown, ovoid, flattened, dried 3–3.5 mm long, 2.3–2.4 mm diam., 1.1–1.3 mm thick, enveloped by gelatinous, sticky, amber substance.

A member of series *Multinervia*, *Anthurium soukupii* ranges from La Paz in Bolivia to Zamora–Chinchipe in Ecuador, at (1,700) 2,000 to 2,400 m in subtropical lower montane moist forest, lower montane wet forest, subtropical montane wet forest, and high montane wet forest life zones.

This species is characterized by its elongate stem, subtriangular petiole, oblanceolate-elliptic blades with more than 20 primary lateral veins and a collective vein arising from near the base, and by its slightly tapered, purple spadix with 5–6 flowers per spiral.

It is probably most easily confused with *Anthurium fasciale*, also from the Atlantic slope in southern Ecuador. That species, in addition to occurring at elevations below 1,600 m, differs in having 8–11 flowers visible per spiral and pistils which dry yellow-brown, lack raphide cells on the surface and are round (not at all protruding) at the apex.

Anthurium soukupii may also be confused with *A. penningtonii*, another species from the Atlantic slope, but the latter differs in having more broadly elliptic blades with the primary lateral veins sharply elevated. There is an even closer resemblance between *A. soukupii* and *A. angustilaminatum*, from the Pacific slope. See that species for a discussion of the differences.

The new species is named in honor of Jaroslav Soukup, author of a book on vernacular names of Peruvian plants and the first to collect *A. soukupii*.

BOLIVIA. COCHABAMBA: Prov. Chapare, San Onafre, 1,700 m, *Steinbach 9419* (GH). LA PAZ: Prov. Sud Yungas, Huancane, 13 km toward San Isidro, N of Chulumani, 2,200 m, *Beck 8756* (MO). ECUADOR. ZAMORA-CHINCHIPE: Loja–Zamora, 13 km E of Loja, 2,220 m, 4°5′S, 79°6′W, *Croat 50747* (CM, MO). PERU. AMAZONAS: Prov. Bongara, Lago Pomacocha, Moyobamba–Pomacocha, Km 340, 2,200 m, 5°47′S, 77°53′W, *Croat 58298* (CM, MO, RSA, USM). CAJAMARCA: Prov. Santa Cruz, Dtto. Catache, upper Río Zaña valley, ca. 5 km above Monte Seco on path to Chorro Blanco, 1,500–2,000 m, *Dillon et al. 4385A, 4905* (F, MO); Prov. Cutervo, Parque Nacional de Cutervo, 2,300–2,400 m, *Díaz et al. 3964*

(MO). CUZCO: Río Lucumayo, La Convención, 6 km from Incatambo, 2,350 m, *Peyton & Peyton 994* (MO); Prov. Urubamba, 2,100 m, *Nuñez 8928* (MO); Machupicchu, on slope 0.5 km N of confluence of Río Sayacmarca and Río Aobamba, 2,370 m, *Peyton & Peyton 1486* (MO); 2.5 km from Machupicchu, above 1st waterfall of Río Mandor, 2290 m, *Peyton & Peyton 455* (MO). JUNÍN: Prov. Oxapampa, *Soukup 2324* (GH). PASCO: Cordillera Yanachaga, trail to summit of Cordillera via Río San Daniel, 2,400 m, 10°23′S, 75°27′W, *Smith et al. 7929* (MO).

Anthurium sparreorum Croat, sp. nov. TYPE: Ecuador. Los Ríos: Centro Cientifico Río Palenque, W of laboratory & vic. of laboratory clearing, 210–250 m, *Croat 38666* (holotype, MO 2387864-65; isotypes, B, CAS, CM, K, M, NY, QCA, RSA, US). Figures 12, 19, 299, 300–302.

Planta plerumque epiphytica, subinde terrestris; cataphyllum late lanceolatum, persistens semi-intactum, demum in reticulum fibris tenuis; petiolus (11.5)15–38 cm longus, 6–15 cm diam., D- ad U-formatus complenatus ad sulcatus ad leviter sulcatus; lamina oblongo-elliptica ad anguste oblanceolata ad oblongo-lanceolata, 46–96 cm longa, (9.5)15–25 cm lata; pedunculus 11–34 cm longus, 5–10 mm diam.; spatha lanceolata vel ovata, (9)12–16 cm longa, 2.8–4.5 cm lata; stipes 5 mm longus; spadix atropurpureus ad violaceus, cylindricus, 5.8–20 cm longus, 8 mm diam.; baccae rubrae.

Usually epiphytic, occasionally terrestrial; stem short and thick, 5.5–15 cm long, 2.5–5 cm diam.; roots numerous, descending, bright green to greenish white, densely pubescent, elongate, 3–5 mm diam.; cataphylls subcoriaceous, broadly lanceolate, conspicuously 1-ribbed, 9–18 cm long, acute at apex with subapical apiculum, green, drying pale yellow-tan (B & K yellow-red 9/7.5), persisting semi-intact, eventually dilacerating into reticulum of fine fibers. *Leaves* erect to spreading; petioles (11.5)15–38 cm long, 6–15 mm diam., D- to U-shaped, flattened and sulcate to weakly convex with the margins bluntly to sharply raised adaxially, rounded to 1–3-ribbed abaxially, the surface densely pale-speckled; geniculum thicker and paler than petiole, 1–2.5 cm; blades coriaceous, oblong-elliptic to narrowly oblanceolate to oblong-lanceolate, acuminate to obtuse-rounded at apex (the acumen weakly apiculate), acute to obtuse or cuneate at base, 46–96 cm long, (9.5)15–22 cm wide, broadest at or near the middle, the margins slightly undulate; upper surface matte to semiglossy, medium to dark green, lower surface glossy to semiglossy, paler; both surfaces drying matte, green to pale yellow; midrib above prominently convex at base, becoming 1-ribbed toward the apex, paler than surface and somewhat speckled, below obtusely raised at base, becoming prominently convex toward the apex and paler than surface, drying convex on both surfaces; primary lateral veins (15)20–30 per side, departing midrib at 40–70° angle, straight or arcuate, prominently convex and paler than surface above, less convex to flat and slightly darker than surface below; interprimary veins almost as conspicuous as primary lateral veins, raised above, flat to weakly raised below; tertiary veins obscure above and below, slightly raised when dried on both surfaces; collective vein arising from near the base, occasionally in the upper third of the blade, weakly sunken and less prominent than primary lateral veins above, raised and equally as prominent as primary lateral veins below, 4–15 mm from margin. *Inflorescences* erect to erect-spreading to spreading, shorter than leaves; peduncle 11–34 cm long, 5–10 mm diam., 0.5–2× as long as petiole, medium green, terete, sometimes 1-ribbed below the spathe; spathe reflexed-spreading, slightly twisted, subcoriaceous, green (B & K green 6/2.5), broadly to narrowly lanceolate or ovate, 9–16 cm long, 2.8–4.5 cm wide, broadest near the base, inserted at 60° angle on peduncle, acuminate at apex (the acumen inrolled), obtuse at base, the margins meeting at 110° angle; stipe 7–10 mm long in front, to 5 mm long in back; spadix dark purple to reddish violet (B & K purple 3/2.5), cylindroid to short-tapered at apex, ± erect, 5.8–20 cm long, ca. 8 mm diam. near base, 4–5 diam. near apex; flowers irregularly 4-lobed to rhombic, 1.8–2.6 mm long, 1.8–2.8 mm wide, the sides jaggedly sigmoid to straight; 9–13 flowers visible in principal spiral, 8–10 in alternate spiral; tepals matte, densely and minutely punctate and papillate; lateral tepals 1–1.2 mm wide, the inner margins straight; pistils scarcely emergent, glossy, papillate, with exposed portion ± rectangular, green; stigma linear, dark purple, 0.4–0.6 mm long; stamens emerging ± regularly and promptly from the base, laterals emerging throughout, or at least to midway, before alternates emerge, borne at the edge of tepals; filaments translucent to greenish, minutely purple-spotted, soon retracting, 0.9 mm wide; anthers pale orange with purple punctations, 0.5–0.7 mm long, 0.7–0.8 mm wide; thecae oblong-ovoid, scarcely divaricate; pollen bright orange fading to lavender or pinkish white, faintly yeasty-scented. *Infructescence* with spathe persisting; spadix 20–22 cm long, ca. 2 cm diam.; berries red, exserted slightly beyond the tepals, subglobose, ca. 5 mm diam.; tepals becoming fleshy, white, enlarged, elongate and 3-sided in cross section with the outer angle of the apex raised and acute.

Anthurium sparreorum is nearly restricted to the Province of Los Ríos in Ecuador, at 210 to 250 m in a tropical moist forest life zone. An additional collection is known from Cotopaxi.

This species is characterized by its short stem, dense, bright green to greenish white roots, cataphylls drying pale yellow-tan and persist semi-intact, coriaceous leaf blades drying matte and green and reddish violet, cylindroid spadix. Most significant is the infructescence, with the berries exserted beyond the tepals. The latter become fleshy, whitish, enlarged and elongated, with the outer edge raised and acute.

Anthurium sparreorum bears some resemblance to both *A. campii* and *A. bucayanum*, which also have large, green-drying leaves with the collective vein arising from near the base. *Anthurium campii* differs in its green spadix, more coriaceous leaf blades, and shorter petioles. *Anthurium bucayanum* differs in its very thin leaves and prominently stipitate spadix. *Anthurium sparreorum* also has a shorter peduncle than either of these species.

The new species is named in honor of the late Benkt Sparre, formerly curator of the Regnellian Herbarium in Stockholm and co-editor of the Flora of Ecuador Project, and his wife, Bride. Together they made concentrated efforts to collect Araceae and discovered numerous novelties in the process.

ECUADOR. Cultivated by Tom Fennel, Homestead, Florida, *Croat 57195* (F, MO). COTOPAXI: Río Guapara, 20 km NW of El Corazón, 250 m, *Sparre 17248* (S). LOS RÍOS: Río Palenque Biological Station, Quevedo–Santo Domingo, 210–250 m, *Croat 38666* (B, CAS, CM, K, M, MO, NY, QCA, RSA, US), *Dodson & Tan 5389* (US, SEL), *Madison 3715* (SEL), *5513* (K), *6959* (MO, SEL, US).

Anthurium spathiphyllum N. E. Br., Gard. Chron. I. 652. 1877. TYPE: Origin unknown, Hort. Kew, 8 Nov. 1876 (holotype, K). Figures 303, 304.

Epiphytic; stem ca. 10 cm long, 2 cm diam.; roots moderately numerous, descending, greenish gray, prominently pubescent, gradually tapered and elongate, 3–5 mm diam.; cataphylls subcoriaceous, lanceolate, 6–8 cm long, cuspidate at apex with subapical apiculum ca. 15 mm long, green, drying pale tan (B & K yellow 9/7.5), persisting as linear fibers. *Leaves* spreading; petioles 6–26 cm long, 5–8 mm diam., triangular, sometimes 3–5-ribbed or flattened with the margins prominently raised adaxially, sharply 1–2-ribbed abaxially; geniculum conspicuously thicker and slightly paler than petiole, 0.7–1 cm long; blades subcoriaceous, linear to narrowly oblong-elliptic or narrowly oblong-oblanceolate, more than 5× longer than wide, acuminate at apex (the acumen apiculate), narrowly acute at base, 46–80 cm long, 5.5–12.5 cm wide, broadest at or above the middle, the margins broadly undulate; upper surface matte to glossy, dark to medium green, lower surface matte to weakly glossy, paler below; midrib flat at base, becoming angular-raised toward the apex above, prominently and sharply raised and slightly paler than surface below; primary lateral veins 20–30 per side, departing midrib at 40–45° angle, straight to the collective vein, deeply sunken above, sharply raised below; interprimary veins almost as conspicuous as primary lateral veins, sunken above, raised below; tertiary veins obscure above, raised and slightly darker than surface below; collective vein arising from near the base, sunken above, sharply raised below, equally as prominent as primary lateral veins, 3–10 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 33–48 cm long, 4–15 mm diam., 2× as long as petiole, green, prominently 2-winged-angled on one side, rounded to sharply acute on the other (or triangular or few-angled near base); spathe erect, hooded over the spadix, subcoriaceous, green, lanceolate to broadly lanceolate, 6.5–8 cm long, 1.7–3 cm wide, broadest near the base, about twice as long as spadix, inserted at 50° angle on peduncle, acuminate at apex (the acumen apiculate, 4 mm long), obtuse to rounded at base; spadix pale yellow to creamy white, cylindroid to clavate, short and stubby, erect, (1.7)2–4 cm long, 6–11 mm diam.; flowers 1.8–2.2 mm long, 1–1.2 mm wide, the sides smoothly to jaggedly sigmoid; 7–12 flowers visible in principal spiral, 11–15 in alternate spiral; tepals matte, densely and minutely papillate; lateral tepals 0.7–0.8 mm wide, the inner margins straight to convex, the outer margins irregularly 2–4-sided; pistils somewhat emergent, matte, pale yellow; stigma linear, 0.1–0.2 mm long; stamens emerging in a scattered pattern throughout, lateral stamens almost to apex before alternates emerge, inclined over and obscuring pistil; filaments fleshy; thecae oblong, not divaricate; pollen pale yellow fading to creamy white. Berries translucent white.

Anthurium spathiphyllum is known from Nicaragua to Panama mostly from sea level to 380 m (rarely to as high as 1,350 m) on the Atlantic slope in wetter parts of tropical wet forest and in premontane wet and tropical wet forest life zones.

Anthurium spathiphyllum can be recognized by its epiphytic habit, chartaceous leaves, usually triangular, sometimes three- to five-ribbed petiole, lanceolate to broadly lanceolate, cucullate spathe, and short, scarcely tapered, pale yellow spadix.

Anthurium spathiphyllum can be confused with *A. bradeanum*, which has a similarly clavate spadix, but that species has oblanceolate-elliptic blades less than five times longer than wide (vs. more than five in *A. spathiphyllum*), with (5)10–15 pairs of primary lateral veins that are not deeply impressed, a peduncle which is not prominently winged, a deflexed, ovate spathe about as long as the spadix, and petioles that are commonly quadrangular in cross section.

COSTA RICA. ALAJUELA: 3 mi. N of San Miguel, 380 m, *Croat 35651* (MO, RSA). HEREDIA: 4 mi. N of Vara Blanca, 1,350 m, *Croat 35571* (MO); Finca La Selva, OTS Field Station on Río Puerto Viejo, just E of its junction with Río Sarapiquí, 100 m, *Wilbur & Jacobs 34194* (DUKE), *Folsom 8950* (CAS); Puerto Viejo de Sarapiquí, along El Surá trail, 100–150 m, *Croat 44309* (MO); Puerto Viejo Region, Río Puerto Viejo, *Burger & Mata 4258* (F); Zona Protectora La Selva, 6 km by road from Río Peje crossing, 5 km SSE of Magsasay, 10°21'N, 84°4'W, 340 m, *Schatz & Grayum 644* (DUKE). LIMÓN: Pandora, 100 m, *Ocampo 1987* (MO); Hacienda Tapezco–Hacienda La Suerte, 29 air km W of Tortuguero, 40 m, 10°30'N, 83°47'W, *Davidson & Donahue 8954* (MO); Quebrada Mata de Limón headwaters, Finca Anai, Sixaola, 25–40 m, 9°35'N, 82°39'W, *Grayum 4515* (MO); Río Parismina, W of Dos Bocas, *Lent 2444* (F); Talamanca, Cocles, 150 m, *Ocampo 1906* (MO). PUNTARENAS: Parque Nacional Corcovado, campamento Sirena, *Téllez et al. 4248* (MEXU, MO). SAN JOSÉ: Parque Nacional Braulio Carrillo, Fila Carrillo, 600–700 m, *Chacón 338* (MO); Chasse, Talamanca, 200 m, *Ocampo 1625* (CR); 300 m, *Ocampo 1624* (CR). NICARAGUA. ZELAYA: 0.3–1.9 km N of Limbaika, 8–10 m, 13°29'N, 84°13'W, *Stevens 8255* (MO); Risco de Oro, 40 m, *Pipoly 5021* (MO); Colonia Kururia, 50 m, 14°41'N, 84°4'W, *Pipoly 3968* (MO); 13 km above Kururia, on road to San Jerónimo, 200 m, 14°39–42'N, 84°4–11'W, *Pipoly 3743, 3830* (MO); Rosita–Puerto Cabezas, 15.7 km SW of Río Kukalaya, 100 m, 13°58'N, 84°12'W, *Stevens 8504* (MO). PANAMA. BOCAS DEL TORO: Changuinola–Almirante, Milla 7.5, above RR stop, *Croat & Porter 16276* (MO), *Kennedy 1273* (DUKE); 15 km S of Changuinola, 300 m, *Antonio 3150* (MO); Almirante–Changuinola Canal, *Blum 1403* (FSU, SCZ). COCLÉ: at confluence of Río Toabre and Río Coclé del Norte, Boca del Toabre, *Lewis et al. 5569* (MO).

Anthurium spectabile Schott, Oesterr. Bot. Z. 8: 181. 1858. TYPE: Costa Rica. Cartago: Volcań Turrialba, *Wendland 506* (holotype, GOET). Figures 305, 319.

Anthurium longispathum Schott, Prodr. Aroid. 520. 1858. TYPE: Costa Rica. Turrialba, *Oersted s.n.* (lectotype, illustrated by Schott Aroideae 707).

Epiphytic; stem erect; cataphylls coriaceous, 17–51 cm long, lanceolate, obtuse to mucronate at apex, light green, drying light tan (B & K yellow-red 9/10), persisting with the apex remaining intact. *Leaves* spreading; petioles 14–63 cm long, 7–12 mm diam., quadrangular, flattened to broadly and sharply sulcate adaxially, the margins sharply raised, sharply 2–3-ribbed abaxially; geniculum thicker and paler than petiole, becoming fissured transversely with age, (1.3)2–7 cm long; blades coriaceous, oblong-lanceolate to oblong or oblong-triangular, rounded to obtuse to acuminate at apex, rounded to truncate at base, 37–140(160) cm long, 8–38(45) cm wide, the margins undulate; upper surface matte to semiglossy, medium green, lower surface semiglossy to glossy, paler; midrib obtusely angular at base, becoming narrowly raised toward the apex above, prominently higher than broad at base, becoming prominently convexly raised toward the apex below, paler than surface above and below; primary lateral veins more than 20 per side, departing midrib at 45–75° angle, prominently and narrowly raised above and below; tertiary veins obscure above, raised and darker than surface below; collective vein arising in the lower half of the blade, sunken above, raised below, less prominent than primary lateral veins, 2–3 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 13–25 cm long, 0.6–0.7× as long as petiole, terete; spathe usually recurled and twisted, prominently reflexed, subcoriaceous, green or violet-purple, narrowly ovate to oblong-lanceolate, 10.5–32 cm long, 3–7 cm wide, inserted at 45° angle on peduncle, acuminate at apex, rounded to subcordate at base; spadix yellow-green, long-tapered, 16–38 cm long, 9–12 mm diam. near base, 6–7 mm diam. near apex; flowers rhombic to 4-lobed, 2.5–4 mm in both directions, the sides sigmoid; 7–11 flowers visible in principal spiral, ca. 9 in alternate spiral; tepals matte to semiglossy; lateral tepals ca. 2.7 mm wide, the inner margins convex; pistils emergent, green, violet-purple at apex; stigma ellipsoid, ca. 1 mm long, stamens emerging promptly throughout length of spadix in a complete sequence, grouped in a circle around the pistil; anthers 1–1.1 mm long, 1–1.2 mm wide; thecae oblong to narrowly ovoid, slightly divaricate; pollen cream. *Infructescence* with spadix to 50 cm long; berries probably orange at maturity, oblong-linear, acute to blunt at apex, 10–14 mm long, ca. 3.5 mm diam.; seeds 2 per berry, 3.4–3.6 mm long, ca. 1.6 mm diam., with a minute appendage at both ends.

Anthurium spectabile is endemic to Costa Rica, where it occurs at 300 to 1,300 m in premontane wet forest and tropical wet forest life zones.

This species is recognized by its elongate, pendent leaf blades with numerous, prominent primary lateral veins and erect, four-sided petioles. Also distinctive are the short peduncle, large, narrowly ovate, often violet-purple spathe, and yellow spadix.

Anthurium spectabile might be confused with *A. ranchoanum*, which has similar leaves (in dried herbarium material) and a similar inflorescence. *Anthurium ranchoanum*, however, has a subterete petiole and a more or less erect leaf blade in line with the petiole. *Anthurium spectabile* also has an elongate, more or less spreading spathe, while the spathe of *A. ranchoanum* is shorter and usually stiffly erect and hooding the spadix.

Anthurium spectabile is extremely similar to *A. pseudospectabile* from Panama, but the latter has proportionally longer blades with more undulate margins, terete petioles, and occurs in premontane rainforest.

COSTA RICA. ALAJUELA: Cariblanco, *Lent 3543* (F); NE of Villa Quesada, *Molina et al. 17287* (F); Naranjo-Aguas Zarcas, Hwy. 15, 8.5 km NE of Villa Quesada, 600 m, *Croat 46968* (F, K, M, MO, NY, RSA, SEL); Río Sarapiquí at bridge on road to Colonia Virgen del Socorro, 830 m, *Croat 68303* (MO). HEREDIA: Río Guacimito, Magsasay, 500 m, *Chacón 167* (MO); Río Peje-Río Sardinalito, Atlantic slope of Volcán Barva, 700–800 m, 10°17.5'N, 84°04.5'W, *Grayum 6719* (MO). LIMÓN: Turrialba-Limón, 11 mi. S of Siquirres, Hwy. 32, 650 m, *Croat 43325* (MO); Guápiles, *Smith 4982* (US); road from Río Frío to Limón, vic. of Río Blanco, W of Guápiles, 360 m, 10°12'N, 83°49'W, *Croat 68428* (MO); Zona Protectora, Barbilla (SE of Squirres), 600–660 m, 10°0'N, 83°28'W, *Grayum et al. 7939* (CR, MO). PUNTARENAS: cultivated at Las Cruces Botanical Garden, 1,300 m, *Croat 44431* (MO). SAN JOSÉ: Carrillo Station, *Gómez et al. 21188* (MO).

Anthurium standleyi Croat & R. A. Baker, Brenesia 16(Suppl. 1): 88. 1979. TYPE: Costa Rica. San José: ca. 5 mi. SW of Canaán along gravel road from Rivas, ca. 900 m, *Croat 43439* (holotype, MO 2582987; isotypes, COL, CR, DUKE, F, K, LE, MEXU, NY, PMA, SEL, US, VEN, W). Figures 306, 307, 320.

Terrestrial; stem to 90 cm long, 2–5 cm diam.; roots descending, greenish to tan, smooth to fuzzy, slightly tapered, 4–12 mm diam.; cataphylls moderately coriaceous, lanceolate, 13.5–30 cm long, obtuse at apex with subapical apiculum, light green, drying tan (B & K red 9/10), persisting semi-intact, eventually as linear fibers. *Leaves* erect to spreading; petioles 43–120 cm long, 7–16 mm diam., stiff, firm, terete to subterete, sometimes weakly flattened adaxially, surface minutely pale-speckled; geniculum slightly thicker and paler than petiole, 3.5–6.5 cm long; blades subcoriaceous, ovate to ovate-triangular, acuminate at apex (the acumen apiculate, downturned), cordate at base, 29–75 cm long, 19–56 cm wide, broadest at the point of petiole attachment or slightly above it, the margins conspicuously undulate; anterior lobe 23–55 cm long; the posterior lobes 7–21 cm long; sinus spathulate to obovate, often closed with the lobes overlapping, 3.5–12 cm deep, the inner edges turned up; upper surface weakly glossy to semiglossy or matte, dark green, lower surface semiglossy to matte, slightly paler; midrib triangular-raised at base, becoming sharply and narrowly raised toward the apex above, prominently and convexly raised and paler than surface below; basal veins 4–6 pairs, 4–5 coalesced 1–4 cm, two lowermost sunken, others raised above, convexly raised below; posterior rib slightly curved, naked, sharply turned up on the outer margin; primary lateral veins 4–9 per side, departing midrib at 45–80° angle, straight, becoming arcuate-ascending, usually only the uppermost loop-connected, convexly raised above and below, prominently raised below on drying; interprimary veins obscure or occasionally raised in grooves above, raised below; tertiary veins obscure above, slightly darker than surface below; reticulate veins slightly raised on both surfaces on drying; collective vein arising from about the middle of the blade, slightly sunken above, raised and slightly darker than surface below, slightly raised above and below on drying, 4–11 mm from margin. *Inflorescences* erect to spreading, much shorter than leaves; peduncle 29–76 cm long, 4–9 mm diam., 0.3–0.8× as long as petiole, green, terete; spathe erect-spreading to reflexed, subcoriaceous, green to yellow-green (B & K yellow-green 6/7.5), oblong-lanceolate, 10.5–18 cm long, 2–4 cm wide, broadest just above the base, inserted at 60–80° angle on peduncle, narrowly acuminate at apex (the acumen inrolled and hooked), obtuse to rounded at base, the margins meeting at 90–180° angle; stipe 11–70 mm long in front, 6–60 mm long in back; spadix heavily tinged with violet-purple at anthesis, becoming yellowish brown, long-tapered, 10–30 cm long, 7–10 mm diam. near base, 4–6 mm diam. near apex; flowers rhombic to weakly 4-lobed, 3.5–3.6 mm long, 2.9–3.3 mm wide, the sides ± straight to smoothly sigmoid; 5–10 flowers visible in principal spiral, 5–7 in alternate spiral; tepals semiglossy; lateral tepals 1.9–2 mm wide, the inner margins broadly convex; pistils weakly raised, medium green; stigma linear at anthesis, 0.4–0.7 mm long, droplets appearing before stamens emerge; stamens emerging from the base in prompt sequence; anthers orange to greenish yellow, 0.6–1 mm long, ca. 1 mm wide, inclined over and obscuring the pistil; thecae ellipsoid, not divaricate; pollen orange fading to creamy white. *Infructescence* arching; spathe reflexed; spadix to 30 cm long, ca. 2 cm diam.; berries orange, broadly ovoid, rounded at apex; mesocarp pulpy, bitter-tasting; seeds 1 or 2 per berry, white, to 5 mm long, ca. 2.5 mm wide, 1.5 mm thick.

Anthurium standleyi is known for certain only from central and southern Costa Rica. It was first collected by Paul Standley at two sites, La Verbena and San Sebastian south of San José in what was probably premontane wet forest. It has been collected more recently in the region northeast of San Isidro del General. The species ranges from 200 to 1,600 m and may be restricted to premontane wet forest.

This species is distinguished by its cordate leaf blades, long-tapered, purplish violet spadix and orange berries. Among Central American species with cordate leaf blades and orange fruits, *A. standleyi* is unique in having an ovate leaf blade and a collective vein originating above the middle of the blade.

Because of its prominently cordate leaf blades, *Anthurium standleyi* is likely to be confused only with *A. watermaliense*, which differs in having the collective vein arising from the first or second basal vein and a proportionally broader, often maroon spathe.

A cultivated collection from the University of Hawaii was reportedly based on a Dressler collection from Achiote, a region of tropical moist forest in the Isthmus of Panama. The species has never been collected in Panama, and the Hawaiian collection is possibly mislabeled.

COSTA RICA. PUNTARENAS: Río Coto Brus, 23 km N of La Unión, Panama border, *Croat 26674* (MO); cultivated at Las Cruces Botanical Garden, 1,300 m, *Croat 44436* (MO). SAN JOSÉ: Santa Eduviges de Escazú, residential neighborhood at W side of Rte. 105, 1,150 m, 9°55′N, 84°08.5′W, *Grayum 9510* (CR, MO); 0.5 mi. above turnoff to Canaán at Rivas, 900 m, *Croat 43431* (MO); 4.5 mi. SW of Canaán, road from Rivas, 900 m, *Croat 43439* (B, CAS, COL, CR, DUKE, F, GH, HUA, K, LE, M, MEXU, MO, NY, PMA, QCA, RSA, SEL, UC, US, VEN, W); La Verbena, *Standley 32243* (US); San Sebastián, *Standley 49296* (US); Talamanca, less than 200 m, *Tonduz 8721* (NY); Cerro Tapezco, *Jiménez 627* (US); Río Buena Vista, S of Buena Vista, NE of San Isidro del General, *Luteyn 3287* (DUKE); Río Herradura (tributary of Río Chirripó del Pacífico), NW of Canaán, Valle General, 1,600 m, 9°29′N, 83°37′W, *Burger & Liesner 7093* (MO, US).

Anthurium superbum Madison, Selbyana 5: 94. 1978.

a. **Anthurium superbum** subsp. **superbum**. TYPE: Ecuador. Napo: La Primavera, Río Napo, *Madison 5516* (holotype, SEL 2727370; isotypes, F, K, MO, QCA, U, US). Figures 308, 309.

Epiphytic; stem 4–8 cm long, 3–4 cm diam.; roots numerous, descending, rose-colored, velutinous, 5–7 mm diam.; cataphylls subcoriaceous, (3)8–10 cm long, acute at apex, dark green, drying brown, persisting intact or semi-intact. *Leaves* erect; petioles 4–12 cm long, 5–8 mm diam., ± D-shaped, with the medial rib and the margins raised adaxially, 3–5-ribbed to rounded abaxially, the surface dark green to sometimes dark purple-green; geniculum slightly thicker than petiole, ca. 0.8 cm long; blades coriaceous, stiff, elliptic to oblong-elliptic, obtuse-rounded at apex, obtuse at base, 34–65 cm long, 12–18 cm wide, broadest just above the middle, the margins revolute; upper surface matte to semiglossy, bullate, dark green, lower surface matte, sometimes tinged reddish or purple; midrib prominently acute above and below; primary lateral veins 7–10 per side, departing midrib at 40–50° angle, very long-arcuate to the margin or slightly arcuate to the collective vein, sunken to weakly raised above, raised below, drying slightly raised above and below; interprimary veins few, less prominent than primary lateral veins; tertiary veins sunken above, raised below, drying slightly raised; collective vein arising from about the middle of the blade or absent, sunken above, raised below, slightly raised above and below when dried, nearly as prominent as primary lateral veins, 10–20 mm from margin. *Inflorescences* erect, shorter than leaves; peduncle 7–18 cm long, 5–12 mm diam., ca. 2× as long as petiole, dark green, terete; spathe spreading to reflexed, subcoriaceous, green, lanceolate-elliptic, 8–9 cm long, 2–3 cm wide, broadest near the base, acute at apex (the acumen slightly inrolled), acute at base; stipe to 5 mm long; spadix creamy white, sometimes faintly tinged with purple, cylindroid, sessile or shortly stipitate, erect, straight to slightly curved, 8–15 cm long, 8–12 mm diam. midway; flowers ± rhombic, 1–1.5 mm long, 1.5–2 mm wide; 16–17 flowers visible in principal spiral, 23–24 in alternate spiral; tepals minutely puberlent to densely papillate; lateral tepals 0.7–0.9 mm wide, inner margins ± straight, outer margins 2–4-sided; pistils prominently exerted, papillate; stigma circular, 0.3 mm long, brushlike.

Infructescence with the spathe persisting; berries lavender with the apical ¼ white, obovoid, sharply apiculate at apex, 6–7 mm long, 2.5 mm diam.

Anthurium superbum is known to occur in tropical moist to tropical wet forest life zones, at 180 to 350 m. It comprises two allopatric subspecies, the typical one in Napo, Ecuador, near La Primavera on the Río Napo, and subsp. *brentberlinii* in Amazonas, Peru, in the Río Cenepa area. Both subspecies are characterized by their stiffly erect, dark green leaves with short petioles and bullate, coriaceous blades often tinged red or purple below, and by the short inflorescence with a whitish spadix with many flowers per spiral. Neither subspecies is likely to be confused with any other member of the section.

While subsp. *brentberlinii* is not known in cultivation, subsp. *superbum* has been cultivated for about 10 years in a few botanical gardens and by a few hobbyists. It is a stunning plant and will, hopefully, become more widespread in cultivation in the future.

ECUADOR. NAPO: Río Napo, La Primavera, *Madison 5516* (F, K, MO, QCA, SEL, U, US); Laguna Taracoa, 250 m, *Christenson 1529* (MO), cultivated.

b. Anthurium superbum subsp. **brentberlinii** Croat, subsp. nov. TYPE: Peru. Amazonas: Río Cenepa, E of community of Huampami, 300–330 m, *Berlin 644* (holotype, MO 2251387; isotype, NY). Figure 310.

Differt ssp. typicum caulibus longioribus, laminas angustioribus, spadice angustiore cum seriebus spiralibus paucioribus florum.

Epiphytic; stem to 16 cm long, 7–14 mm diam.; roots dense, 3–5 cm long, 3–4 mm diam.; cataphylls subcoriaceous, linear-lanceolate, 3–13 cm long, drying reddish brown, persisting semi-intact. *Leaves* erect; petioles 9–17 cm long, 5–10 mm diam., D-shaped, with the medial rib and margins raised adaxially, angular abaxially; geniculum somewhat darker than petiole when dried, 0.5–1 cm long; sheath 2.5–4 cm long; blades coriaceous, oblong-elliptic, acute to obtuse at apex, attenuate to acute at base, 45–70 cm long, 9–17 cm wide, broadest just above the middle; upper surface apparently quilted, lower surface often tinged red or purple; midrib acutely raised above and below; primary lateral veins 4–9 per side, departing midrib at 50–60° angle, very long-arcuate to the margin or slightly arcuate to the collective vein, raised to obscure above, raised below when dried; interprimary veins usually present, less conspicuous than primary lateral veins; tertiary veins weakly raised to obscure above and below when dried; collective vein arising from about the middle of the blade or absent, rarely from near the base, sunken above, raised below when dried, equally as prominent as primary lateral veins, 10–15 mm from margin. *Inflorescences* erect; peduncle 11–29 cm long, 2–5 mm diam., 1–2.6× as long as petiole, terete; spathe reflexed, subcoriaceous, green, oblong-lanceolate, 4–10 cm long, 1–2 cm wide, broadest near the base, acute at apex, acute at base; spadix white, cylindroid, ± straight, 5–7 cm long, 4–6 mm diam. midway; flowers ± rhombic, ca. 0.8 mm in both directions; ca. 12–15 flowers visible in either spiral; tepals densely papillate; stamens held erect above the tepals; filaments exserted 0.2 mm; anthers 0.2 mm in both directions. *Infructescence* spreading-pendent; spathe persisting or absent; spadix 20 cm long, 2 cm diam., with berries scattered throughout; berries purple, tipped white (B & K purple 5/5), obovoid-ellipsoid, obtuse at apex, ca. 7 mm long, ca. 4 mm diam.; pericarp with numerous raphide cells; seeds 1–2 per berry, yellow-brown when dried, oblong, 2 mm long, 1 mm diam.

Anthurium superbum subsp. *brentberlinii* is endemic to northern Peru in Amazonas, where it is known only from the Río Cenepa area at 180 to 350 m in a tropical wet forest life zone.

This subspecies is characterized by its slender, densely rooted stem, short petioles, oblong-elliptic leaf blades with steeply ascending primary lateral veins and often tinged red or purple below, and cylindroid, white spadix with very small flowers.

Anthurium superbum subsp. *brentberlinii* differs from the typical subspecies because of its narrower leaf blades, more slender stem, and more slender spadix with fewer flowers per spiral.

The new subspecies is named in honor of Brent Berlin (Department of Anthropology, University of California at Berkeley), who coordinated all known collections of this taxon.

PERU. AMAZONAS: Río Cenepa, Cenepa area, 250 m, *Kayap 1252* (MO); Cenepa–Quebrada Kayamas, 250 m, *Berlin 513* (MO); above Quebrada Shimpunts, 250–350 m, *Berlin 886* (MO); Huampami, 200–400 m, 4°30′S, 78°30′W, *Berlin 644* (MO, NY); *Kayap 2007* (MO), *Kujikat 162* (MO).

Anthurium tarapotense Engl., Pflanzenr. IV. 23B(Heft 21): 74. 1905. TYPE: Peru. San Martín: Tarapoto, *Ule 5p* (holotype, B). Figures 311, 312.

Terrestrial, occasionally epiphytic; stem short, 1.5–4 cm diam.; roots dense, spreading to descending, pale green, velutinous, short, tapered, 2–6 mm diam.; cataphylls lanceolate, subcoriaceous, 5–12 cm long, acuminate at apex, drying dark reddish brown, persisting semi-intact, eventually deciduous. *Leaves* erect to spreading; petioles 7–19 cm long, 3–10 mm diam., erect, sharply D-shaped, broadly convex to 1-ribbed to flattened or somewhat sulcate with the margins sharply raised or sharp but not raised adaxially, rounded to weakly 1-ribbed abaxially; geniculum moderately thicker and paler than petiole, becoming transversely fissured with age, 0.5–3 cm long; sheath 2–5 cm long; blades subcoriaceous to moderately coriaceous, broadly elliptic to broadly oblanceolate to oblanceolate, long-acuminate at apex (the acumen apiculate), long-attenuate to attenuate, rarely acute at base, (15)30–60(90) cm long, 8–27 cm wide, broadest near or above the middle, the margins undulate; upper surface weakly glossy to semiglossy, medium green (B & K green 2/2.5), lower surface semiglossy, conspicuously paler, both drying brown to greenish brown; midrib flat and 1-ribbed at base, becoming acutely angular toward the apex above, higher than broad at base, becoming obtusely angular and then convexly raised at apex below; primary lateral veins 5–10(16) per side, departing midrib at 40–80° angle, straight to less often arcuate to the margin, paler than surface, convexly raised above and below, more so above; tertiary veins obscure above, prominulous and darker than surface below; collective vein arising from about the middle of the blade, near the apex or absent, prominulous on both surfaces, to 12 mm from margin. *Inflorescences* erect to spreading; peduncle 23–50 cm long, 3–4 mm diam., 2–4.6 × as long as petioles, yellowish green tinged with reddish in the lower half or purple, terete; spathe spreading to reflexed, subcoriaceous, concolorous with the petiole, sometimes tinged with purple or purple throughout, ovate-lanceolate to oblong-lanceolate, 4.5–15 cm long, 0.9–1.9 cm wide, inserted at 60° angle on peduncle, acuminate at apex (the acumen inrolled), rounded to obtuse at base; spadix purple to maroon (B & K red-purple 2/10) to yellowish green, sessile or stipitate to 5 mm, cylindroid to slightly tapered, erect to somewhat curved, (3)4–16 cm long, 4–6 mm diam. near base, 3–4 mm diam. near apex; flowers 4-lobed, 1.5–2.5 mm in both directions, the sides straight to jaggedly sigmoid; 4–6 flowers visible in principal spiral, 4–8 in alternate spiral; tepals matte, white-punctulate; lateral tepals 0.8–1.5 mm wide, the inner margins broadly rounded, the outer margins 2–3-sided; pistil weakly raised; stigma slitlike to ellipsoid, 0.4–0.6 mm long; stamens emerging irregularly, the laterals preceding the alternates by up to 16 spirals, the 3rd stamen preceding the 4th by 3–4 spirals, borne at edge of the tepals; anthers pinkish to reddish or orangish, 0.4–0.7 mm long, 0.6–0.8 mm wide; thecae ellipsoid, divaricate; pollen yellow to pale yellow, sometimes fading to white and then turning lavender. *Infructescence* with spathe persisting, peduncle 38–44 cm long; berries deep purple, obovoid; seeds 2 per berry.

Anthurium tarapotense is endemic to Peru, where it is apparently confined to premontane moist forest at (300) 360 to 700 m, in the vicinities of Tocache and Tarapoto in Dept. San Martín.

This species is characterized by its obovate to obovate-oblanceolate blades, which are attenuate in the lower third and merge gradually with the petiole, and by the short, D-shaped petioles, frequently more or less intact cataphylls, and tapered or cylindroid, usually maroon or purple spadix.

Two individual live plants, from near Tabalosos, Peru, collected together sterile and bearing the same collection number (*Croat 58130a* and *58130b*), differ substantially and perhaps represent parts of a mixed collection. One of the two, *58130b*, perhaps deserves subspecific recognition. It shares nearly identical leaves with typical *A. tarapotense* (*58130a* representing the species well), but differs in having cataphylls weathering promptly to fibers and a spadix with pistils protruding above the anthers at anthesis and an ellipsoid, caviform stigma bearing stigmatic papillae well below the upper rim. The anthers, immediately after dehiscence (when they are most prominent), are relatively inconspicuous compared to the pistils. In contrast, the pistils of typical *A. tarapotense* are not at all exserted at anthesis and consist of a narrow slit more or less obscured by the anthers. Also, the spadix of *Croat 58130b* is grayish pink, not maroon or yellowish green as in typical *A. tarapotense*.

Anthurium tarapotense is probably most closely related to *A. llewelynii*, which occurs in the same region, but in more exposed sites in tropical dry forest. Both species share similar long-pedunculate inflorescences with moderately short, bluntly tapered spadices and blades markedly arched along the midrib. *Anthurium llewelynii* differs in having larger, narrowly oblanceolate leaves, which end abruptly at the narrowly rounded base, and a reddish olive-green spadix.

PERU. MARISCAL CÁCERES: Dtto. Tocache, Nuevo, Quebrada de Mantención, road to Tocache Progresso, 500–

600 m, *Schunke 13648* (IBE, MO). SAN MARTÍN: hills above Chazute, 200–300 m, 6°34′S, 76°12′W, *Knapp 8349* (MO); Tarapoto, *Ule 5* (B); 360–460 m, *Kennedy 3529* (F); Tarapoto–Yurimaguas, 10.6 km from junction with road to Río Huallaga, 530 m, 06°30′S, 76°21′W, *Croat 58115* (IBE, JBGP, K, MO, NY, USM), *58116* (AAU, MO, P, QCA, SEL, U, UCLA, USM, VDB), *58117* (B, CAS, CM, G, GH, K, LE, M, MO, US, USM, VEN, W, WIS); Río Mayo, Tarapoto–Moyobamba, between Km 562 and 563, 15 km W of Tabalosos, 57 km W of Tarapoto, 600 m, 6°15′S, 76°41′W, *Croat 58130* (CM, IBE, KYO, MO, NY, SEL, USM); Dtto. Tarapoto, Tarapoto–Yurimaguas, near Km 10, 700 m, *Rimachi 5369* (IBE).

Anthurium tenaense Croat, sp. nov. TYPE: Ecuador. Napo: along road between Tena and Puyo, 58.1 km N of Puyo, 600 m, *Croat 49631* (holotype, MO 2738143). Figures 313, 314.

Planta epiphytica; caulis erectus; petiolus 18–19 cm longus, ca. 5–6 mm diam., D-formatus; lamina oblongo-oblanceolata ad oblongo-elliptica, 37–42 cm longa, 9–9.5 cm lata; pedunculus 19.5 cm longus; spatha 8 cm longa, 1 cm lata; spadix (immaturus) 6 cm longus, 3 mm diam.

Epiphytic; stem erect; internodes short, roots numerous, drying whitish; cataphylls unribbed, 6 cm long, drying grayish brown, persisting intact, eventually shredding at base. *Leaves* with petioles (8–9)18–19 cm long, ca. (3–4)5–6 mm diam., ± D-shaped, with obtuse medial rib and with the margins sharply raised adaxially, rounded abaxially; geniculum drying slightly darker and narrower than petiole, (0.4)0.6–0.9 cm long; sheath 2.5–5.5 cm long, free-ending; blades coriaceous, narrowly oblong-elliptic, acute to long attenuate at apex, acute to obtuse (rounded) at base, (23.2)32.5–69 cm long, (5.0–5.6)9–9.5 cm wide, broadest at or above the middle, the margins weakly undulate; both surfaces drying matte, reddish brown, slightly paler below; midrib obtusely angular to broadly convex at base, becoming narrowly acute toward the apex above, more prominently raised below, bluntly acute, becoming narrowly convex toward the apex, darker than surface when dried; primary lateral veins 5–8 per side, departing midrib at 65–90° angle, prominently arcuate to the margin, drying convexly raised and darker than surface above and below; interprimary veins not numerous, less prominent than primary lateral veins; tertiary veins darker than surface when fresh, prominulous; reticulate veins visible on either surface; collective vein arising from near the apex, probably sunken above, raised above and below when dried, 4–10 mm from margin. *Inflorescences* with peduncle (19.5)22.5–60 cm long, (2–3)6–9 mm diam. when dried, ca. (1.5)2.5–3× as long as petiole; spathe green, subcoriaceous, lanceolate with acumen inrolled, (7.6)9–15 cm long, 1–2.5 cm wide, acute at apex, long attenuate at base; spadix green, cylindric to long-tapered, 6–18 cm long, 3–7 mm diam. near base, 1–2 mm diam. near apex; flowers rhombic to 4-lobed, (1–1.5)1.8–2.3 mm long, (0.8–0.9)1.6–1.8 mm wide, the sides moderately straight to jaggedly to smoothly sigmoid; (6–7)8–17 flowers visible in principal spiral, 5 in alternate spiral; tepals minutely granular-papillate, lateral tepals (0.6)0.8–10 mm wide, ± shield-shaped, the inner margins straight to broadly rounded, the outer margins irregularly (2–3)3–4-sided; exposed portion of the pistil rectangular; stigma slitlike, 0.2–0.4 mm long.

Anthurium tenaense is known from Napo Province, Ecuador, near Tena (hence the name), in a tropical wet forest life zone at 400–600 m.

This species is characterized by its thick, more or less elliptic blades, which dry brown, and by its D-shaped petiole, which is rounded abaxially with a broad, obtuse rib, and with raised margins adaxially.

Anthurium tenaense is not easily confused with any other species, although it bears a resemblance to *A. uleanum*, which has thinner leaves mostly drying dark brown, and to *A. harlingianum*, which has broader leaves, more primary lateral veins (12–23) per side, and a slightly to conspicuously curved, salmon-pink to pale violet spadix.

ECUADOR. NAPO: Tena–Puyo, 58.1 km N of Puyo, 600 m, *Croat 49631* (MO); Tena, Estación Biológica Jatun Sacha, 8 km E of Misahuallí, 1°04′S, 77°36′W, 400 m, *Cerón 6073, 6074* (MO).

Anthurium uleanum Engl., Pflanzenr. IV. 23B(Heft 21): 74. 1905.

a. **Anthurium uleanum** var. **uleanum**. TYPE: Brazil. Amazonas: Rio Juruá Mirim ("Miry"), *Ule 5731* (holotype, B; isotypes, G, MG). Figures 315–317.

Anthurium tenuispadix Engl., Pflanzenr. IV. 23B(Heft 21): 73. 1905. TYPE: Brazil. Amazonas: Rio Juruá Mirim ("Miry"), *Ule 5597* (holotype, B; isotypes, G, MG).

Anthurium tessmannii K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 9:260. 1925. TYPE: Peru. Loreto: Prov. Requena, Cumaria, Río Ucayali, 225 m, *Tessmann 3351* (holotype, B).

Epiphytic; stem to 15 cm long, ca. 2.5 cm diam.; roots dense, green to whitish, smooth to velutinous, 2–5 mm diam.; cataphylls lanceolate, straight to curved, subcoriaceous, 2–11.5 cm long, acute to acuminate at apex, drying reddish brown (B & K yellow-red 4/10), persisting semi-intact, weathering to reticulate fibers, apex sometimes remaining semi-intact. *Leaves* erect-spreading; petioles (3)10–36 cm long, 2–10 mm diam., D-shaped, sulcate adaxially with medial rib and acute margins, rounded or 2–7-ribbed abaxially; geniculum shaped like petiole, paler and thicker, 0.3–2 cm long; sheath 2.5–6 cm long; blades subcoriaceous, oblong-elliptic to oblong-oblanceolate to obovate, acute to acuminate at apex (the acumen flat), attenuate to acute at base, rarely truncate or subcordate, 20–65 cm long, 5.5–24 cm wide, broadest at or above the middle, the margins broadly undulate; upper surface semiglossy, medium green, drying gray to greenish brown, lower surface matte to semiglossy, slightly paler, drying greenish to gray-green to brown; midrib acutely raised above, acutely to obtusely or convexly raised below; primary lateral veins 5–11 per side, departing midrib at 30–85° angle, straight to arcuate to the margin, acutely raised; tertiary veins prominulous, raised on both surfaces on drying; collective vein arising from near the apex or absent, rarely from below the middle, sunken above, prominulous below, 4–8 mm from margin. *Inflorescences* erect to spreading or spreading-pendent, usually shorter than leaves; peduncle 14–38 cm long, 3–6 mm diam., rarely less on drying, 0.5–3.7(6)× as long as petioles, terete, firm, flexible; spathe spreading to reflexed, rarely erect, subcoriaceous, matte abaxially, medium to pale green, sometimes tinged with red at margins, lanceolate to oblong-lanceolate, 3.5–14 cm long, 0.6–2.7 cm wide, broadest near the base, inserted at 30–50° angle on peduncle, acute to acuminate at apex (the acumen inrolled), acute to obtuse (sometimes decurrent 5–17 mm) at base; stipe 3–7 mm long in front, 2–5 mm long in back; spadix usually pale reddish to purplish (B & K red 8/10), sometimes white to pale green, usually appearing glaucous, cylindroid to slightly tapered, curved, erect, (3)5–15 cm long, 3–5 mm diam. midway, 2–3 mm diam. near apex; flowers rhombic to 4-lobed, scarcely distinguishable, margins obscure, 1.8–2.5 mm long, 1.7–2.5 mm wide, the sides straight to jaggedly sigmoid; 6–10 flowers visible in principal spiral, 6–8 in alternate spiral; tepals matte, weakly papillate, pale olive; lateral tepals (0.5)2–2.2 mm wide, the inner margins broadly rounded to straight, the outer margins 2–3-sided; pistils weakly raised, not emergent, white to pale pinkish; stigma ellipsoid, 0.3 mm long; stamens emerging promptly in a regular sequence from the base, held well above the tepals then retracting to the tepal level, the laterals preceding the alternates by ca. 4–5 spirals, the 3rd stamen preceding the 4th by ca. 2 spirals; anthers white to pinkish, 0.4 mm long, 0.4–0.5 mm wide, inclined over and obscuring the pistil; thecae oblong, divaricate or not; pollen pale yellow, drying white. *Infructescence* ± pendent; spadix to 25 cm long, 1 cm diam.; berries reddish violet, 5 mm long, 2–4 mm diam.; seeds 1–2 per berry, 2.2–2.5 mm long, 0.8–0.9 mm thick, 1.2–1.3 mm wide.

Anthurium uleanum is endemic to the upper Amazon basin, ranging from Ecuador and southern Colombia (Meta, Amazonas, and Vaupés), to Peru (Loreto, Huánuco, Amazonas, and Ucayali), and western Brazil (Acre and Amazonas). It occurs below 550 m in tropical moist, premontane wet, and subtropical wet forest life zones.

This species is distinguished by its long-petiolate, brown-drying leaves, long peduncle, spreading spathe and slender, mostly pale purple, glaucous spadix.

Anthurium uleanum is closest to *A. ernestii*, differing in the presence of a waxy, dustlike bloom on the tepals giving the spadix a matte, pale appearance. A difference that can be used to determine fruiting collections is the slender, often curved, tapered spadix of the present species, rather than a more or less cylindroid, stubby one. *Anthurium uleanum* also has proportionately longer petioles, frequently up to half as long as the blade, and the blades tend to dry brown to dark brown. *Anthurium ernestii* typically has petioles much less than one-third as long as the blade and leaf blades, most often drying greenish with orangish or brownish primary lateral veins. *Anthurium uleanum* has cataphylls which tend to persist intact or semi-intact for a long period before ultimately weathering to fibers. Often there are 2–3 more or less intact cataphylls on a plant. In contrast, the cataphylls of *A. ernestii* persist quite characteristically as an intact network of fine, very pale fibers, and frequently there is little evidence of intact cataphylls on dried specimens.

Another species which may be confused with *A. uleanum* due to having a similar waxy, grayish spadix is *A. manuanum*. See the discussion under that species for distinction from *A. uleanum*.

The new variety of *A. uleanum*, var. *nanayense*, is a morphologically homogeneous taxon restricted to Loreto, Peru, mainly in the Iquitos region. See discussion under the variety for further details.

Synonymized here for the first time is *A. tenuispadix*. Its type (*Ule 5597*), collected at the same locality as that of *A. uleanum*, differs slightly from the latter in having leaf blades attenuate at the base rather than ending abruptly. Engler separated the two species in his key on presumed differences in the shape of the lateral tepals, but these differences in shape are probably due to their relative ages. Neither the difference in blade shape nor the tepal shape warrants separation of *A. tenuispadix.*

The type of *Anthurium tessmannii* (*Tessmann 3351*), considered here as a synonym, is also toward the larger end of the spectrum in terms of leaf blade size (ca. 65 cm long, 19 cm wide).

Some collections made in the northwestern part of the range of *A. uleanum* in the Province of Napo, Ecuador, differ from Peruvian material and collections from further south in Ecuador in having broader, larger leaf blades with frequently obtuse bases. *Brandbyge & Asanza 30425* and *Pinkley 290* are examples. There is, however, an overall gradation to "typical" Peruvian material within Ecuador.

Several other collections deserve mention. The leaf blades of a collection from the Río Ampiyacu in Loreto, Peru (*Plowman et al. 6541*), are unusual in having only a few, very steeply ascending primary lateral veins (parallel to the margin for most of their length) and a geniculum noticeably shrunken to a narrower diameter than the attending midrib or petiole. The leaf blade, in color and venation, bears some resemblance to that of *A. superbum* subsp. *brentberlinii. Harling & Andersson 17571, Mexia 6142a,* and *Wurdack 2109* are unusually large plants. The following measurements, contrasted with those of typical material, circumscribe the main differences: petioles 45 cm long (vs. up to 36 cm); leaf blade 85 cm long (vs. up to 65 cm) and up to 31 cm wide (vs. up to 24 cm); peduncle 43–51 cm long (vs. 14–38 cm). The spadix does not differ significantly from that found on those of other plants which are vegetatively more typical and have shorter peduncles.

BRAZIL. ACRE: Cruzeiro do Sul–Rio Branco, 44 km E of Cruzeiro do Sul, Fazenda da Dona Cabuca, 150 m, 7°38′S, 72°35′W, *Croat 62334* (INPA, MO, NY); Rio Moa, Igarape Ipiranga–Aquidaba, Cruzeiro do Sul, *Prance et al. 12049* (INPA, NY, U, US); Cruzeiro do Sul, 150 m, 7°37′S, 72°37′W, *Croat & Rosas 62304* (CM, G, IBE, INPA, K, MBM, MO, NY, QCA, RSA, US); Mpo. Caramari Amazonas, Rio Juruá, N of Cruzeiro do Sul, Lago da Cigana (São Luis), S of Porto Alvaro Nestrinho, 150 m, 7°37′S, 72°36′W, *Croat 62498* (CAS, CM, GB, INPA, K, MO, RSA, SAR, TEX); Mpo. Cruzeiro do Sul, Cruzeiro do Sul–Rio Branco, INCRA headquarters and forest reserve, 160 m, 7°38′S, 72°35′W, *Croat 62629* (INPA, MO). AMAZONAS: Rio Cunhua, basin of Rio Purus, Deni Indian village, 6°43′S, 66°47′W, *Prance et al. 16534* (INPA, NY); Rio Javarí, N of Palmeiras airstrip, 5°08′S, 72°49′W, *Lleras et al. P17101* (INPA); Rio Juruá Mirim ("Miry"), *Ule 5597, 5731* (B, G, MG); Manaus–Porto Velho, 8 km S of Rio Jutai, *Prance et al. 22916* (NY, US). COLOMBIA. AMAZONAS: Río Loretoyacu, vic. Puerto Nariño, *Zarucchi & Schultes 1069* (GH); 100 m, *Schultes 8468* (GH). META: Río Guayabero, 235 m, *Garcia-Barriga & Mejia 17071* (COL); 10 km from Caño Lozada, 350 m, *Pinto et al. 222* (COL, P); VAUPES: Río Apaporis, Río Pacoa, 300 m, 0°20′N, 71°20′W, *Schultes & Cabrera 15221* (COL); Río Pacoa–Río Kananari, 250 m, *Schultes & Cabrera 13703* (COL, US); Soratama, above mouth of Río Kananari, 300 m, 0°5′N, 70°40′W, *Schultes & Cabrera 15164* (US). ECUADOR. NAPO: Parque Nacional Yasuní, 200 m, 0°55′S, 76°11′W, *Cerón & Hurtado 4015* (MO); Pozo petrolero Daimi 2, 200 m, 0°55′S, 76°11′W, *Cerón & Hurtado 4177* (MO); Lago Agrio–Coca, 4.7 km N of Coca, *Croat 50408* (MO); 15 km N of Coca, 450 m, 0°30′S, 76°56′W, *Croat 50412* (AAU, F, GH, K, MO, WIS); San Pablo de Los Secoyas, W–SW of Shushufindi, 300 m, 0°15′S, 76°21′W, *Brandbyge & Asanza 32894* (AAU, MO); Concepción, Hacienda Cotapino, 550 m, 0°48′S, 77°25′W, *Harling et al. 7111* (GB); Coca–El Auca, SE of Francisco de Orellana, road to El Auca, 14.6 km past bridge over Río Napo, 450 m, 0°37′S, 76°40′W, *Croat 50382* (M, MO, NY, QCA, RSA); Lago Agrio, 250 m, 0°6′N, 76°55′W, *Brandbyge & Asanza 30425* (AAU, MO); Lago Agrio–Francisco de Orellana, 26 km N of Coca, 450 m, 0°29′S, 76°55′W, *Croat 50422* (MO, QCA); Lago Agrio–Coca, along Cepe Ferry Rd., 8.8 km S of Río Aguarico on road to Coca (San Francisco de Orellana), *Croat 58519* (MO); Lago Agrio–Puerto El Carmen de Putomayo, 2.2 km SE of Guarumo, 240 m, *Croat 58617* (MO, NY); Tena–Puyo, 61.5 km N of Puyo, 500 m, *Croat 49661* (MO); Río Aguarico, 60 km downstream from San Pablo de Las Secoyas, 220 m, 0°18′S, 76°00′W, *Holm-Nielsen et al. 21120* (AAU); 40 km downstream from San Pablo de Las Secoyas, 230 m, 0°16′S, 76°11′W, *Holm-Nielsen et al. 21095, 21098, 21099* (AAU); Shushufindi, 244 m, *Vickers 220, 254* (F); Dureno, *Pinkley 134, 290* (ECON); 11.4 km W of Lago Agrio, 340 m, 0°8′N, 76°58′W, *Macbryde & Dwyer 1405* (MO); E of Lago Agrio, road to Cepe Ferry Crossing, 450 m, 0°2′N, 76°50′W, *Croat 50426* (MO); Río Cuyabeno, 10 km upstream from Río Aguas Negras, 220 m, 0°10′S, 75°58′W, *Holm-Nielsen et al. 21171* (AAU); Laguna Grande vic., 265 m, *Nielsen 76207* (AAU); Río Napo, Limoncocha, *SEL 78-1155* (cultivated) (MO); Estación Biológica Jatún Sacha, 8 km E of Misahuallí, 450 m, 1°04′S, 77°36′W, *Ceron & Hurtado 3666* (MO); Río Pucino, Lago Agrio, 250 m, *Gentry 9826* (MO); Río Putumayo, Baeza–Puerto El Carmen de Putumayo, 2.1 km W of Guarumo, 43.7 km SE of Lago Agrio, 240 m, 0°07′N, 76°39′W, *Croat 58593* (MO, QCA); Lago Agrio–Río San Miguel, 12.5 km N of Lago Agrio, 0°06′N, 76°50′W, *Croat 50321* (MO); Río San Miguel, 21.2 km N of Lago Agrio, 470 m, 0°8′N, 76°50′W, *Croat 50374* (MO); Yasuní Nacional Parque, 230 m, 0°52′S, 76°05′W, *Cerón 3402* (MO); Río Yasuní, Lago Garza Cocha, 200 m, 1°05′S, 75°47′W, *Lawesson et al. 43345* (AAU); Puerto Napo–Misahuallí, 3.8 km W of Misahuallí, 370 m, 1°02′S, 77°42′W, *Croat 58888* (MO); at junction of Río Tivacuno and Río Tiputini, 220 m, 0°45′S, 76°20′W, *Coello 216* (MO, NY). PASTAZA: Río Curaray, Curaray, 2 km W of the school, 250 m, 1°22′S, 76°58′W, *Holm-Nielsen et al. 21892* (MO); Sucumbios, Reserva Faunistica Guyabeno, S of Laguna Garzacocha, 265 m, 0°01′S, 76°11′W, *Balslev et al. 84679* (AAU); between Laguna Añangueno and Río Cuyabeno, 265 m, 0°01′S, 76°11′W, *Balslev et al. 84882* (AAU);

Río Cuyabeno, Puerto Montúfar, 230 m, 0°06'S, 76°01'W, *Holm-Nielsen et al. 21302* (AAU); Río Namoyacu, 21 km E of Curaray, 200 m, *Harling & Andersson 17569* (GB, MO), *17571* (GB); Río Tiguino, via Auca, 115 km S of Coca, Carretera Petro-Canada, 320 m, 1°15'S, 76°55'W, *Hurtado 1298, 1345, 1548* (MO), *Hurtado & Neill 1506, 1521, 1572, 1573* (MO), *Zak & Rubio 4318B* (MO); Valle de La Muerte, Curaray, 240 m, 1°25'S, 76°52'W, *Holm-Nielsen et al. 22467* (AAU). PERU. AMAZONAS: Prov. Bagua, Río Marañon, Teniente Pinglo, above Pongo de Manseriche, 250–300 m, *Wurdack 2109* (BH, US); Río Santiago, above Pongo de Manseriche, 200 m, *Mexia 6142a* (F, GH, K, UC). HUÁNUCO: Río Pachitea, Puerto Lira, 300 m, *Killip & Smith 26833* (NY, US). LORETO: Iquitos, Amazonas Lodge, *Ellenberg 8463* (MO); Río Corrientes, almost at Ecuadorian border, upriver from Tnte. Lopéz oil camp, 280–300 m, *Gentry et al. 18971* (MO); Río Huallaga, Santa Rosa, below Yurimaguas, 135 m, *Killip & Smith 28769, 28922* (NY, US); Yurimaguas–Balsapuerto, 135–150 m, *Killip & Smith 28285* (NY, S); Río Samaria, Atún Cocha, *Vásquez et al. 4346* (MO); Río Sucasari, tributary of Río Napo, 3°16'S, 72°54'W, *Martin et al. 1747* (ECON, F); Prov. Loreto, San José de Parinari, 150 m, 4°32'S, 74°30'W, *Vásquez & Jaramillo 3354* (MO); Río Corrientes, Valencia, Platanoyacu, ca. 3°10'S, 75°41'W, *McDaniel & Marcos 11131* (MO); Río Macusari, 220–300 m, 2°55'S, 76°15'W, *Lewis et al. 11044* (MO); Prov. Maynas, Ecuador border, 1–5 km from Puerto Peru (military post, 8 km from mouth of Río Gueppi, trib. of Río Putumayo) on trail to Río Napo, 200 m, *Gentry et al. 22038* (F); Iquitos Region, Las Pebas, Río Ampiyacu, 3°10'S, 71°49'W, *Plowman et al. 6541* (GH); Río Yaguasyacu, affluent of Río Ampiyacu, Brillo Nuevo, 2°40'S, 72°00'W, *Plowman et al. 6884* (GH); Río Yavarí, Caserío Paumari, *Revilla 2203* (MO); Prov. Requena, Río Ucayali, Cumaria, 225 m, *Tessman 3351* (B). UCAYALI: Cerro Las Cachoeiras, Quebrada Sapallal, tributary of Q. Shesha, near Peru–Brazil border, 260 m, 8°2'S, 73°55'W, *Gentry & Díaz 58467* (MO); vic. LSV base camp, Quebrada Shesha (trib. of Río Abajao), 65 km NE of Pucallpa, 250 m, 8°02'S, 73°55'W, *Gentry & Díaz 58571* (B, K, MO, US); Prov. Coronel Portillo, Bosque Nacional A. V. Humboldt, 8°40'S, 74°45'W, *Vásquez 3891* (MO).

b. Anthurium uleanum var. **nanayense** Croat, var. nov. TYPE: Peru. Loreto: Mishana, Río Nanay, 120 m, *Solomon 3562* (holotype, MO 2627652). Figure 318.

Differt a var. typicum pro ratione habitu parvioro et seriebus spiralibus ferentibus floribus paucioribus.

Epiphytic, sometimes terrestrial; stem moderately slender, elongate, creeping, up to 100 cm long, 0.7–1.7 cm diam.; leaf scars obscured by root mass, 0.4–1 cm high, 0.9–1 cm wide; roots forming a dense, contiguous mass, ascending or descending, pale green to white, when dried grayish to brownish gray, smooth, fleshy, elongate, tapered, to 10 cm long, (1)2–3 mm diam.; cataphylls subcoriaceous, lanceolate, 3–6 cm long, acuminate at apex, drying brown to reddish brown, persisting semi-intact, eventually deciduous. *Leaves* spreading-pendent to spreading; petioles 5.5–19 cm long, 2–4 mm diam., subterete to C-shaped or sometimes D-shaped, with medial rib and margins raised adaxially, rounded abaxially; geniculum slightly thicker and paler than petiole, sometimes up to 3 cm remote from base of the blade, 0.3–1 cm long; sheath 2–2.5 cm long; blades thinly coriaceous, somewhat chartaceous, broadly elliptic to oblanceolate or broadly oblanceolate, shortly acuminate and apiculate at apex (the acumen downturned, 10–15 mm long), usually attenuate (sometimes acute to obtuse) at base, 22.5–43.5 cm long, 8–17.5 cm wide, broadest at or above the middle, the margins sometimes concave near the base; upper surface matte to semiglossy, medium green, lower surface matte, slightly paler; both surfaces drying matte to sometimes weakly glossy, grayish green to brown, with reddish brown major veins; midrib bluntly to acutely raised at base, becoming narrowly raised toward the apex above, prominently convex to higher than broad and slightly paler than surface below; primary lateral veins 5–7 per side, departing midrib at 40–55° angle, straight then arcuate to the margin, prominently convex above, occasionally raised in shallow valleys, more prominently raised below; interprimary veins if present almost as conspicuous as primary lateral veins, weakly sunken above, raised below; tertiary veins obscure above, flat to slightly raised and somewhat darker than surface below; reticulate veins slightly raised or obscure below when dried; collective vein arising from near the apex or absent, if present weakly sunken to flat above, raised below, drying less prominent than primary lateral veins and raised on both surfaces, ca. 3–7 mm from margin. *Inflorescences* much shorter than leaves; peduncle (4.8)16–28 cm long, drying 1–3 mm diam., 1.2–4.4× as long as petiole, ± terete; spathe spreading, subcoriaceous, green, linear-lanceolate, 4–9.4 cm long, 0.6–1 cm wide, broadest near the base, acuminate at apex (the acumen apiculate, occasionally cuspidate), narrowly acute to almost decurrent at base, the margins meeting at 20° angle; stipe 6–17 mm long in front, 1–2 mm long in back; spadix purplish becoming grayish to white, sometimes reported as green, oblong, weakly tapered, curved, 5–7 cm long, 3–4(5) mm diam. near base, 2–3 mm diam. near apex; flowers ± rhombic, (1.4)1.9–2.1 mm long, (1.1)2.4–2.6 mm wide, the sides smoothly to jaggedly sigmoid; 3–4 flowers visible in principal spiral, 4–6 in alternate spiral; tepals densely and conspicuously papillate to granulose, sometimes appearing glaucous; lateral tepals (1–1.7 mm wide, the inner margins broadly convex, the outer margins 2–3-sided; pistils slightly raised; stigma broadly ellipsoid, 0.3–0.4 mm long; stamens grouped in a tight cluster above the pistil; anthers 0.4–0.5 mm long, 0.3–0.5 mm wide; thecae oblong, slightly or not at all divaricate. *Infructescence* with spathe persisting, withered; spadix 7.5–9.8 cm long, 0.6–0.9 cm diam.; berries violet, ± ovoid, ca. 3.5 mm long, 3.4 mm diam.; seeds drying yellowish brown, ovoid, darker at the ends, ca. 1.7–2 mm long, 1.2–1.4 mm diam., 1 mm thick.

Anthurium uleanum var. *nanayense* is endemic to Peru in Loreto Department at 100 to 160 m, in the tropical moist forest transitional to tropical wet forest life zone. All collections have been made in the Iquitos region in Maynas Province, many from the Río Nanay (hence the name).

This variety is characterized by its relatively small size, rather elongate stem, broadly oblanceolate to almost obovate leaf blades drying brown and attenuate to narrowly acute at the base and slender, tapered spadix apparently starting as purplish and eventually becoming grayish white (appearing glaucous).

Variety *nanayense* is likely to be confused only with var. *uleanum*, which occurs in the same area and differs in having longer petioles, a longer spadix, more oblong leaf blades, and fewer flowers per spiral. Variety *nanayense* is smaller in overall size than var. *uleanum*, and the uniformity of herbarium specimens of the former is notable.

PERU. LORETO: 17 km SW of Iquitos, *Croat 18460A* (MO); Río Nanay, Iquitos, 100 m, *Plowman 2482* (F, GH); Mishana, 120 m, *Solomon 3559, 3562* (MO); Río Tepiche, Santa Elena, *McDaniel & Marcos 11261* (MO); Prov. Maynas, Iquitos Region, ca. 120 m, *Revilla 3597* (MO), *3685* (AMAZ, F, MO); Río Momón, 130 m, *Croat 19929* (MO), *Díaz & Jaramillo 45* (MO), *Rimachi 7711, 7856, 7858* (IBE, MO); Mishana, 130 m, 3°55′S, 73°35′W, *Vásquez et al. 5319* (MO); Puerto Almendras, 122 m, 3°48′S, 73°25′W, *Vásquez & Jaramillo 3159, 6100, 6618, 7590* (MO); Río Nanay, Casería Mishana, 30 km SW of Iquitos, *Foster 4215, 4227, 4350, 4437* (F); Iquitos–Santa María de Nanay, Mishana, 140 m, 3°50′S, 73°30′W, *Gentry & Emmons 38015* (MO), *Gentry et al. 28905, 31632, 36437* (MO); Santa María de Nanay, 130 m, *Schunke 2453* (F, NY); Río Putomayo, Ecuador border, Guarnición Militar de Gueppi, *Díaz 356* (F); Río Yaguasyacu, affluent of Río Ampiyacu, Brillo Nuevo, 2°40′S, 72°00′W, *Plowman et al. 6854* (GH); Prov. Maynas, Dtto. Iquitos, Iquitos Region, Puerto Almendras, 120 m, 3°48′S, 73°25′W, *Croat 51207* (MO); Iquitos–Puerto Almendras, 15 km from Iquitos, 120 m, 3°47′S, 73°25′W, *Croat 51190* (MO); Río Nanay, Carretera de Picuruyacu, 160 m, *Rimachi 5464* (IBE); Prov. Requena, Río Ucayali, 4°55′S 73°45′W, *Gentry et al. 56361* (MO).

Anthurium upalaense Croat & R. A. Baker, Brenesia 16(Suppl. 1): 97. 1979. TYPE: Costa Rica. Alajuela: between Cañas (Guanacaste) and Upala, near Río Zapote, 1.8–2.7 km S of Rio Canalete, ca. 1,000 m, *Croat 36342* (holotype, MO 2381219; isotypes, CR, F, K). Figures 321, 323, 324.

Epiphytic; stem less than 20 cm long, 1.5–3 cm diam.; leaf scars obscured by root mass and persistent cataphylls; roots moderately dense and numerous, brown to green, scurfy to pubescent, moderately thick and elongate, mostly 2–6 mm diam.; cataphylls lanceolate, coriaceous, acutely 1-ribbed throughout, 11–25 cm long, obtuse to acute to narrowly acuminate at apex, plain green to slightly tinged with red, drying brown, persisting intact, eventually deciduous. *Leaves* erect-spreading to spreading; petioles (6)10–47 cm long, 7–13 mm diam., subquadrangular, broadly sulcate with the margins sharply raised adaxially, 3–5-ribbed abaxially, the surface pale-speckled; geniculum thicker and paler than petiole, sometimes reddish abaxially, 1–2 cm long; blades subcoriaceous to coriaceous, elliptic to narrowly oblong-elliptic to oblong-lanceolate, obtuse to acute to gradually acuminate at apex (the acumen downturned and weakly apiculate), usually acute to narrowly acute (rarely obtuse) at base, (30)40–106 cm long, (4.5)8–34 cm wide, broadest at or near the middle, the margins prominently undulate; upper surface semiglossy, dark green, lower surface semiglossy to glossy, slightly paler; midrib flat to obscurely angular at base, becoming prominently and sharply raised toward the apex and paler than surface above, prominently higher than broad and 3-ribbed at base, becoming prominently and acutely raised toward the apex below; primary lateral veins 10–20 per side, departing midrib at 60–75° angle, almost straight to the collective vein, loop-connected in the upper half, prominently and convexly raised above and below, more so above, paler than surface; interprimary veins less prominent than primary lateral veins; tertiary veins weakly visible, paler than surface above, darker than surface below, flat above and below; reticulate veins partially visible above, darker than surface below, drying prominulous above and below; collective vein arising in the upper half or in the upper third of the blade, flat, when dried slightly raised on both surfaces, 3–5 mm from margin. *Inflorescences* erect to spreading or arching-pendent; peduncle (18)40–54 cm long, 4–10 mm diam., equaling to 1.4–2.4× as long as petiole, light green, weakly pale-speckled, sometimes tinged with purple at base, terete or 1-ribbed below opening of the spathe, sometimes faintly many-ribbed; spathe erect to reflexed, often rolled up, subcoriaceous, yellow-green, sometimes heavily tinged with violet-purple (B & K yellow-green 6/7.5 to 7/2.5), oblong-lanceolate to lanceolate, (4.5)8–20 cm long, 1–4 cm wide, broadest near the base, inserted at 60–75° angle on peduncle, short-acuminate (the acumen minutely inrolled), acute to decurrent on peduncle at base, the margins meeting at 20–60° angle; spadix green (B & K yellow-green 5/6) to maroon (B & K red-purple 2/7.5), long-tapered, 9–30 cm long, 6–15 mm diam. near base, 4–6 mm diam. near apex; flowers square to rhombic, 2.3–3.4 mm long, 1.7–2.8 mm wide, the sides shallowly sigmoid to straight; 10–20 flowers visible in principal spiral, 7–15 in alternate spiral; tepals matte, inconspicuously pale punctate, with droplets appearing usually after 2 or more anthers emerge; lateral tepals 0.8–1.8 mm wide, the inner margins straight to slightly convex; pistils raised, rectangular to bluntly pyramidal, green to purplish; stigma ellipsoid, green, 0.4–1.1 mm long, brush-like, droplets appearing 12–22 days before stamens emerge, persisting for 5–15 days; stamens emerging ± rapidly from the base or near the base, grouped in a tight cluster above the pistil; filaments retracting, short, ca. 0.2 mm long, 0.5–1 mm wide; anthers pale orange, 0.5–0.6 mm long, 0.7–1 mm wide, contiguous; thecae ellipsoid, scarcely divaricate; pollen orange fading to pale orange to lavender to white or tan. *Infructescence* pendent; spathe reflexed; spadix to 55 cm long, 6 cm diam., with berries emerging ± uniformly throughout; berries red, oblong, acute at apex, tapered to both ends, to 15 mm long; mesocarp mealy, white, sweet; seeds 2 per berry, white, oblong, to 4 mm long.

Anthurium upalaense is known from the Atlantic slope of Nicaragua and Costa Rica, from near sea level to usually less than 700 m (rarely to 1,300 m) in tropical wet forest, premontane wet forest, and wetter parts of tropical moist forest.

This species is distinguished by its persisting, intact cataphylls, moderately long, subquadrangular, sulcate petioles which are 3–5-ribbed abaxially, long-tapered, usually violet-purple spadix and red fruits.

Anthurium upalaense is most closely related to *A. purpureospathum*. See that species for distinguishing characters. It is also apparently related to *A. concolor* from Panama, but differs in having the inflorescence pendent, the spadix long-tapered and more or less green at anthesis, the spathe longer and recurled, and the fresh anthers pale orange.

In Nicaragua *Anthurium upalaense* can be confused with *A. schlechtendalii*, but that species differs in having most cataphylls weathering to fibers, as well as generally shorter, less conspicuously tapered spadix and thicker, more prominently reflexed spathe which is more heavily tinged with purple.

COSTA RICA. Cultivated at Kew: *Brown s.n.* (K), *Bull 467/1873* (K). ALAJUELA: Florencia–Fortuna, 1 km S of Río Peñas Blancas bridge on road 142, 80 m, 10°22'N, 84°35'W, *Hammel et al. 14054* (MO); NW of New Arenal Volcano, W of Fortuna, *Taylor & Taylor 1170* (NY); San Juan de Lajas, *Smith 1498* (NY); NE of Ciudad Quesada, Artezalea and Methodist Rural Center, *Molina et al. 17264* (EAP, F); Cañas–Upala Road, 3–4 km NNE of Bijagua, along new road to Upala, 400–450 m, 10°45'N, 85°3'W, *Baker & Burger 9859* (CR, F, MO), *Croat 36319* (MO); Río Zapote, 1.8–5 km S of Río Canalete, 100–200 m, *Burger & Baker 9964* (F), *10001* (CR, F, MO), *Croat 36380* (MO), *Croat 36342* (CR, F, K, MO); Lago Arenal, Alto de la Carpintera, Tilarán, *Brenes 18194, 18195* (CR); Río Frío, Los Chiles, 30–40 m, 11°2'N, 84°44'W, *Holm & Iltis 771* (NY), *811* (B, K, P, U). CARTAGO: 24 km NE of Turrialba on road to Limón, 450–525 m, 9°58'N, 83°34'W, *Liesner et al. 15363* (B, MO, WIS); 5 km NE of Río Grande de Orosi at Tapantí, 1,300 m, *Utley & Utley 5062* (MO); Tucurrique, Las Vueltas, *Tonduz 13319* (US); Forests of Tuis, Turrialba, *Pittier 12720* (US); Lake Bonilla, *Pacheco 92* (F). GUANACASTE: El Arenal, *Standley & Valerio 45328* (US); Río Aguacate, Laguna de Arenal, 500 m, *Khan et al. 1085* (BM); Río Chiquito, slope above Lake Arenal, 600–700 m, 10°25'N, 84°46'W, *Haber et al. 4819* (MO). HEREDIA: Puerto Viejo Region, Finca La Selva, *Folsom 9558* (TEX), *Croat 61218* (MO); on Río Puerto Viejo just E of its junction with Río Sarapiquí, 100 m, *Chacón 462* (MO), *Croat 44263, 44297* (MO), *McDowell 389, 1058* (MO); Río Sucio, 20 m, *Croat 35708* (MO); Puerto Viejo–San José, SW of Puerto Viejo, *Burger & Mata 4343* (F, CR). LIMÓN: Cahuita–Limón, vic. Cahuita, 0–10 m, 9°57'N, 83°2'W, *Baker & Burger 17A, 17B* (CR, F, MO); 3 km W and 1.9 km S from Guayacan, highway to Limón, Los Angeles de Siquirres, 1,000 m, *Gomez et al. 20543* (CR, MO, MSC, WIS); Hacienda Tapezco–Hacienda La Suerte, 29 air km W of Tortuguero, 40 m, 10°30'N, 83°47'W, *Davidson & Donahue 8727* (MO); Pandora, 100 m, *Ocampo 1985* (MO); Hacienda Tapezco–Hacienda La Suerte, 29 air km W of Tortuguero, 40 m, 10°30'N, 83°47'W, *Davidson & Donahue 8272, 8608* (MO); swamp at Manzanillo de Talamanca, 5 m, 9°38'N, 82°39'W, *Grayum & Burton 4324* (MO); Puerto Viejo de Talamanca–Manzanillo, 10–20 m, 10°38–39'N, 82°40–44'W, *Grayum 3638* (MO); Hone Creek-NW on trail paralleling Río Carbón, *Utley & Utley 660* (F); Limón, *Burger & Burger 8446* (CR, F); Limón–Puerto Viejo, *Baker & Burger 174* (F); hills 3.5 air km S of Islas Buena Vista in Río Colorado, 16 air km SW of Barra del Colorado, 10–120 m, 10°39'N, 83°40'40"W, *Davidse & Herrera 31271* (MO, W); Cerro Coronel, E of Río Zapote, 10–100 m, 10°40'N, 83°40'W, *Stevens 23923* (MO); E of Laguna Danto, 20–170 m, 10°41'N, 83°38′W, *Stevens 23726* (MO); Cordillera de Talamanca, Reserva Biol. Hitoy Cerere, Cerro Bitarkara, 800 m, 09°38′25″N, 83°08′15″W, *Herrera & Solís 2493* (CR, MO); Tsaki, *Pittier 9509* (BR), *Tonduz 9507* (BR, CR); Parque Tortuguero, 4 m, 10°31′N, 83°30′W, *Robles 1331* (F, L, MO), *1332* (MO); Forests of Shirores, Talamanca, *Tonduz 9228* (BR); Quebrada Mata de Limón headwaters, Finca Anai, Sixaola, 25–40 m, 9°35′N, 82°39′W, *Grayum 4501* (MO); Río Catarata, Bribri, 50 m, *Croat 43221* (F, K, MBM, MO, NY, RSA, SEL); Río Madre, 11 mi SW of Limón, Hwy. 32, 10 m, *Croat 43305* (AAU, CR, G, GH, K, LE, MO, NY, P, RSA, UCLA, W, WIS); Río Reventazón, Cairo, Hamburg Finca, *Standley & Valerio 48869* (US). PUNTARENAS: Cantón of Coto Brus, Las Cruces Tropical Botanical Garden, 6 km W of San Vito de Java, 1,200 m, *Croat 57257* (CR, MO). NICARAGUA. CHONTALES: 4 km NW of Santo Domingo, 250 m, 12°18′N, 85°7′W, *Grijalva & Soza 3749* (MO); N of Cuapa, 700 m, *Atwood & Neill AN35* (MO); confluence of Río El Jordan and Río La Pradera, Hacienda San Martín, 390 m, 12°17′N, 85°15′W, *Stevens 21826* (MO); Cerro Oluma, NE side, above Hacienda San Pedro Oluma, 600–700 m, 12°18′N, 85°23′W, *Nee 28359* (MO). JINOTEGA: Río Coco, Rapido Plis, 200 m, 14°0–10′N, 85°20–30′W, *Stevens et al. 16823* (MO). MATAGALPA: above Matagalpa–Siuna road, La Gloria, 78 km from Matagalpa, 600 m, 13°15′N, 85°35′W, *Moreno 17218* (MO); Cerro Musun, Río Bilampi, 500–800 m, *Neill 1782* (MO); Wanawas, 200–500 m, *Araquistain & Moreno 2739* (BM, LE, MBM, MO), *2744* (MO); 4 km SW of Wanawas, 200–500 m, 13°0–1′N, 85°14′W, *Araquistain & Moreno 2658* (MO, NY); Quebrada Las Carpas, El Limón, 580 m, 13°15′N, 85°34′W, *Stevens & Moreno 19715* (MO). RÍO SAN JUAN: Río Santa Cruz–Caño Santa Crucita, La Palma, 40–60 m, 11°2–4′N, 84°24–26′W, *Stevens 23437* (MO), *Neill 1552* (MO); 1 km W of San Juan del Norte, 0–2 m, 10°55′N, 83°43′W, *Rivière 222* (MO); Río San Juan, San Juan del Norte, Caño la Barca, 0–10 m, *Araquistain 3283, 3302, 3401* (MO), *Martinez & Rivière 1952* (MEXU), *1957* (MEXU, MO). ZELAYA: Waslaya–Siuna, 6 km W of La Cuesta El Balsamo, Rosa Grande, 260–300 m, 13°38′N, 85°2′W, *Moreno 19190* (MO); Río Blanco–Río Copalar, 29–31 km E of Río Blanco, 200–400 m, 12°50–55′N, 85°0–5′W, *Stevens 12143, 12182, 12206* (MO); El Recreo, *Atwood & Neill AN233* (MO); stream 1 km N of Las Mercedes, 160–180 m, *Vincelli 328A* (MO); Monkey Point, 3 km above Caño El Pato, 10 m, 11°35′N, 83°42′W, *Moreno 12466* (MO); Siuna–Matagalpa, 31.4 km beyond Río Uli, 8.9 km beyond Rosa Grande La Balsamo, 200 m, *Stevens 7524* (MO); Caño Monte Cristo, La Grupera, 10 m, 11°33′N, 84°48′W, *Moreno & Sandino 14688, 14655* (MO); village of Germán Pomares, Las Benitas, 100 m, 11°36′N, 83°51′W, *Moreno & Sandino 14933* (MO); Cerro Waylawas (Peñas Blancas), 5 k S of Wany, 13°30′20″N, 84°45′25″W, *Grijalva & Burgos 1685* (MO); Río Punta Gorda, Atlanta, 10 m, 11°34′N, 84°1′W, *Moreno & Sandino 12755* (MO); Río Sucio, 0.5 km E of 1st suspension bridge E of Bonanza, 140 m, 14°1′N, 84°34′W, *Stevens 12317* (MO).

Anthurium validifolium K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 11: 607. 1932. TYPE: Panama. Chiriquí: forests along Río Ladrillo, above El Boquete, 1,200–1,300 m, *Pittier 3052* (holotype, US). Figures 322, 325–327, 231, 232.

Epiphytic; stem to 16 cm long; leaf scars 2.5 cm wide; roots numerous, descending, green, smooth, 5–15 mm diam.; cataphylls moderately coriaceous, 20–30 cm long, long-acuminate at apex, medium green, sparsely pale-speckled, matte, drying tan (B & K yellow-red 9/10), persisting ± intact. *Leaves* erect-spreading; petioles 20–27 cm long, 7–10 mm diam., quadrangular to bluntly D-shaped, flattened to broadly and shallowly sulcate adaxially, rounded abaxially, surface pale-speckled; geniculum thicker and slightly paler than petiole, becoming fissured transversely with age, 3–4.5 cm long; blades coriaceous, oblong to oblong-oblanceolate or lanceolate, acute at apex (the acumen apiculate), acute and decurrent to rounded at base, 47–69 cm long, 10–19 cm wide, broadest at or near the middle, the margins broadly undulate; both surfaces matte, dark green above, paler below; midrib flat at base, becoming obtusely angular and narrowly raised at apex above, bluntly 2-ribbed and higher than broad at base, becoming prominently and convexly raised toward the apex below; primary lateral veins numerous, departing midrib at 60–70° angle, ± straight, arcuate near the margin, sunken in grooves above, raised below, paler than surfaces; interprimary veins obscure above, darker than surface below; tertiary veins obscure above, darker than surface below; collective vein arising in the upper third of the blade, weakly sunken above, raised below, less prominent than primary lateral veins, 5–6 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle 33–39 cm long, 9–12 mm diam., 2× as long as petiole, subterete; spathe reflexed, coriaceous, dark green (B & K yellow-green 5/10), ovate-lanceolate, 16–17 cm long, ca. 4 cm wide, inserted at 45° angle on peduncle, acuminate at apex, rounded at base; stipe 7–13 mm long in front, ca. 3 mm long in back; spadix pale lavender to violet-purple (B & K purple 6/5 to 5/2.5), tapered, 15–23 cm long, (4)6–12 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic, 3–3.5 mm long, 3.1–3.6 mm wide, the sides straight to weakly sigmoid; 7–8 flowers visible in principal spiral, 8–10 in alternate spiral; tepals matte; lateral tepals 1.5–1.8 mm wide, the inner margins broadly convex; pistils scarcely emergent, green; stigma ellipsoid, ca. 0.6 mm long, droplets appearing for ca. 1 week before stamens emerge; stamens emerging rapidly from near the base or sometimes from near the middle, lateral stamens emerging to midway before alternates appear; anthers yellow-orange, ca. 1 mm long, 1.2 mm wide, inclined over the pistil; thecae oblong-ellipsoid, scarcely divaricate; pollen yellow-orange (B & K yellow-red 8/5). *Infructescence* pendent; spathe twisted; spadix 24–26 cm long, 2.3–2.5 cm diam.; berries bright orange, obovoid, flattened at apex, 0.8–15 mm long; pericarp thin, ± transparent; mesocarp fleshy, orange, with minute raphide cells; seeds 1–2 per berry, pale yellow, ovoid, with a somewhat flattened appendage at both ends, enveloped by somewhat dry, sac-like structure.

Anthurium validifolium is known from Chiriquí Province in Panama and adjacent Puntarenas Province in Costa Rica. Most collections have been made in lower montane rain forest, from 1,200 to 2,300 m.

This species is characterized by its large, moderately thick, lanceolate leaf blades, lavender to purple spadix, and bright orange, obovoid berries.

Anthurium validifolium is probably most closely related to *A. seibertii* and *A. protensum*, which share a similar inflorescence and orange berries. It differs from both in having broader and thicker leaf blades. Its subquadrangular petiole is somewhat intermediate between the terete petiole of *A. protensum* and the sharply quadrangular petiole of *A. seibertii*. Although this suggests *A. validifolium* may be a hybrid between *A. protensum* and *A. seibertii*, its thicker, proportionately shorter blades are not a feature of those species.

The specimen from Puntarenas was cultivated at Las Cruces Tropical Botanical Garden, but was reported to have been collected locally by Robert Wilson, founder of the garden.

COSTA RICA. PUNTARENAS: Cantón of Coto Brus, Las Cruces Tropical Botanical Garden, 6 km W of San Vito de Java, *Croat 44445, 57258, 57279* (MO). PANAMA. CHIRIQUÍ: 2 mi. N of El Hato del Volcán, *Croat 10667* (B, F, GH, K, MO, NY, PMA, RSA, US); Cerro Pelota, 2,300 m, 8°54′N, 82°43′W, *Knapp 1513* (F, MO); Cerro Pelota, lower slopes, 1,800–2,000 m, 8°53′N, 82°43′W, *Knapp 1497* (K, MO); ridge S of Cerro Pelota, 1,700–2,200 m, 8°53′N, 82°43′W, *Knapp 1522, 1523, 1526, 1528, 1529* (MO); Cerro Punta, 4.7 mi. E of Volcán, 1,600 m, 8°49′N, 82°38′W, *Croat 66204* (MO); Volcán–Río Sereno, 1,520 m, *Croat 66321* (MO); Bambito–Cerro Punta, *Croat 10553* (MO); *Croat 10554* (F, MO); Boquete Region, 9 km WNW of Boquete, 1,870 m, *Davidse & D'Arcy 10309* (MO, PMA); Cerro Pando, NW side, *Croat 15971* (MO, NY); Río Colorado, 1,200–1,400 m, 8°50′N, 82°43′W, *Hamilton & Stockwell 3532* (MO); Río Ladrillo, El Boquete, 1,200–1,300 m, *Pittier 3052* (US).

Anthurium vaupesianum Croat, sp. nov. TYPE: Colombia. Vaupés: vic. Mitú, 2–3 km below Urania, Río Vaupés, *Zarucchi & McElroy 1172* (holotype, GH; isotype, COL). Figures 329, 330.

Planta epiphytica; internodia brevia, 1–2 cm diam.; cataphyllum lanceolatum; petiolus 4–9 cm longus, 3–5 mm diam., complanatus et obtuse costatus adaxile, abaxile rotundatus ad trinervis; lamina coriacea–subcoriacea, oblanceolata-obovata, abrupte attenuate in dimidio inferiore, 20–62 cm longa, 9–26 cm lata; nervis primariis lateralibus 6–12 utroque; pedunculus (16)36–70 cm longus; spatha oblonga-linearis, viridis-olivacea, 9–20 cm longa, 0.6–1.5 cm lata; spadix brunneo-rubellus aut virellus, sessilis vel stipitatus, ad 3.5 cm, longe contractus, 20–35 cm longus, 3–4 mm diam.; baccae violaceae.

Epiphytic; stem to 9 cm long, 1–2 cm diam.; roots dense, ascending, fuzzy, soon glabrous, 3–4 mm diam.; cataphylls subcoriaceous, lanceolate, 3–5 cm long, acuminate at apex, drying dark reddish brown, semi-intact, persisting briefly. *Leaves* erect-spreading; petioles 4–9 cm long, 3–7 mm diam., D-shaped, flattened and conspicuously and obtusely ribbed adaxially, rounded to weakly angulate or weakly 3-ribbed abaxially; geniculum thicker than petiole, 0.5–1 cm long; sheath 3–7 cm long; blades coriaceous to subcoriaceous, oblanceolate-obovate, acute at apex, narrowly attenuate, ending narrowly acute to obtuse at base, 20–62 cm long, 9–26 cm wide, broadest above the middle, the margins usually flat, sometimes weakly and broadly undulate; upper surface semiglossy, medium green, lower surface weakly glossy, paler; both surfaces drying grayish to grayish brown; midrib convexly raised at base, becoming sharply raised (knifelike) toward the apex above, acutely raised at base, becoming convex toward the apex below; primary lateral veins 6–12 per side, departing midrib at 30–50° angle, straight to arcuate-ascending to the margin, raised in shallow grooves above; tertiary veins conspicuously sunken above, conspicuously raised below; collective vein arising from near the apex or absent, sunken above, raised below, 6–12 mm from margin. *Inflorescences* erect to pendent, ± equaling leaves; peduncle (16)36–70 cm long, (1)3–4 mm diam., (2.7)4–7.7× as long as petiole, terete; spathe spreading to reflexed, subcoriaceous, green to brownish green, sometimes mottled purple, oblong-linear, 9–20 cm long, 0.6–1.5 cm wide, inserted at 40° angle on peduncle, acute at apex, attenuate at base; spadix brown to reddish to greenish or gray-brown (once reported as white), long-tapered, sessile or stipitate to 3.5 cm, somewhat curved, 20–38 cm long, drying 3–4 mm diam.

midway, 2 mm diam. near apex; flowers rhombic, 1.4–1.8 mm long, 1.2–1.4 mm wide, the sides straight to smoothly or jaggedly sigmoid; 3–5 flowers visible in principal spiral, 3 in alternate spiral; tepals semiglossy, minutely papillate; lateral tepals 0.7–0.9 mm wide, the inner margins straight to rounded, the outer margins 2-sided; anthers 0.4 mm in both directions, inclined over and obscuring the pistil; thecae ellipsoid, slightly divaricate. *Infructescence* with spathe persisting ± intact; spadix 0.9 cm diam.; berries violet.

Anthurium vaupesianum is endemic to southern Colombia in Vaupés (hence the name) and Amazonas departments, where it is an epiphyte at 130–250 m in tropical premontane wet forest.

This species is characterized by its small size, short petioles, obovate-oblanceolate leaf blades drying grayish-brown and usually rather abruptly attenuate in the lower half with conspicuously concave margins, and by its very slender, long-tapered spadix. It is probably most closely allied to *A. anorianum* from Antioquia Dept. in northern Colombia. Although it has a similar long, slender spadix, the latter has larger leaves that have convex margins in the lower half and are obtuse to acute at the base, and peduncles that dry reddish. It occurs at 300 to 750 m, in a region separated from *A. vaupesianum* by two major mountain ranges.

COLOMBIA. AMAZONAS: Río Caqueta, La Padrera, 240 m, *García-Barriga 14605* (COL). AMAZONAS-VAUPÉS: Río Apaporis, Río Pacoa–Río Cananarí, Soratama, 250 m, *Schultes & Cabrera 13535, 13796* (ECON), *12772, 13621* (US); Jinogoje, mouth of Río Piraparana, 230 m, 0°15′S, 70°30′W, *Schultes & Cabrera 19820* (US). VAUPÉS: 2 km SE of Mitú, 200 m, 1°14′N, 70°14′W, *Croat 56795* (AAU, COL, F, JAUM, K, M, MO, NY, RSA, US); Río Kubiyu, vicinity of Mitú, *Zarucchi & Davis 1185* (COL, GH); Río Piraparana, middle course, *Schultes & Cabrera 17128* (US); Río Vaupés, Mitú, 2–3 km below Urania, *Zarucchi & McElroy 1172* (COL, GH).

Anthurium venosum Griseb., Cat. Pl. Cub. 219. 1866. TYPE: Cuba. Westindische Province, *Wright 3209* (holotype, MO 2058854; isotypes, NY, US). Figures 328, 349, 350.

Terrestrial or epilithic. Stem short, ca. 1.5–2 cm diam.; roots dense, grayish, moderately to densely velutinous, moderately elongate, ca. 3–5 mm diam.; cataphylls subcoriaceous, lanceolate, 3–6 cm long, acute at apex, brown (B & K yellow 4/2.5), persisting semi-intact, eventually as a reticulum of fibers. *Leaves* with petioles (5)15–40 cm long, ca. (3)6–10 mm diam., terete to weakly sulcate, medium green; geniculum 1 cm long; blades coriaceous to subcoriaceous, oblong-ovate, acute to shortly acuminate at apex (the acumen shortly apiculate), ± rounded to subcordate or weakly cordate at base, (17)24.5–46 cm long, (12.5)15.7–21.5 cm wide, broadest at or near the middle, the margins broadly undulate; anterior lobe (15)22.5–40 cm long; the posterior lobes (3.5)5–6 cm long, (4)5–6 cm wide, directed downward and rounded at apex; sinus mostly triangular, rarely arcuate with the blade decurrent on petiole to shallowly triangular, 1–3 cm deep; both surfaces glossy, moderately bicolorous, drying yellowish brown to yellowish green; midrib convexly raised above, paler than surface, more prominently raised below; basal veins 3–4 pairs, all free to base, raised above and below; primary lateral veins 5–9 per side, departing midrib at 40–65° angle, straight to broadly arcuate, prominently raised and paler than surface above and below; interprimary veins almost as conspicuous as primary lateral veins; tertiary veins prominulous; reticulate veins raised; collective vein arising from near the apex or absent. *Inflorescences* spreading; peduncle 12–84 cm long, ca. 3–8 mm diam., 1.4–2.9× as long as petiole; spathe reflexed, subcoriaceous, green, lanceolate to linear-lanceolate, 3–10 cm long, 1–1.5 cm wide, broadest near the base, acuminate at apex (the acumen sometimes cuspidate, 6–7 mm long), acute to decurrent at base; stipe 15–17 mm long in front, 5 mm long in back; spadix brownish green to purplish brown, tapered, ± erect to curved, 2–15 cm long, 5–6 mm diam. near base, 2–3 mm diam. near apex; flowers rhombic, 2.5–2.9 mm long, 1.4–2 mm wide, the sides straight to smoothly sigmoid; 5–6 flowers visible in principal spiral, 8–9 in alternate spiral; tepals weakly roughened; lateral tepals 1.3–1.7 mm wide, the inner margins broadly convex, the outer margins 2-sided; pistils pale green; stigma ± ellipsoid, 0.3–0.4 mm long; anthers 0.3–0.4 mm long, 0.5–0.7 mm wide; thecae ± ovoid, not at all or only slightly divaricate. *Infructescence* with spathe persisting; spadix to 17 cm long, to 2 cm diam.; berries orange-red, ± ovoid to obovoid, 6–6.5 mm long, 4.5–6.2 mm diam.; seeds 1–2 per berry, brown with numerous pale raphide cells on the surface, 3.7–4 mm long, 1.7–2.8 mm diam., 1.2–1.8 mm thick.

Anthurium venosum is known only from Cuba and is apparently restricted to Piñar del Río Province, especially around Viñales, where it occurs on limestone cliffs at less than 300 m.

This species is distinguished at once by its rather small, oblong-ovate leaf blades with conspicuous basal veins (3 to 4 pairs) and more or less rounded to shallowly cordate leaf bases, and brownish green, tapered spadix.

Anthurium venosum is a distinctive species within the section, but has been confused with other species in the West Indies. Most notable perhaps is a population of plants on Jamaica in St. James Parish at 700 m, which resembles both *A. mancuniense* C. D. Adams and the present species. This was reported by Adams (1972) for Jamaica based upon *Proctor 7977* and *Proctor & Stern 11748*. Although these specimens look more like *A. venosum*, a re-collection (*Croat 69757*) proves that it belongs to neither species and probably represents a new species not belonging to sect. *Pachyneurium*.

CUBA. NO FURTHER LOCALITY: *Wright 3209* (MO, NY, US); Cultivated at Havana Botanical Garden, *Croat 69756* (MO). PINAR DEL RÍO: 250 m, *Rutten-Pekelharing & Gillavry 425* (B), *Hermann 3183* (NY, US); Mogote de la Baudera Viñales, *Leon 14378* (NY); Mogote de La Jagua, La Jagua, Consolación del Norte, *Roig & Asary 2540* (NY); San Vicente, Viñales, *Leon 22746* (US); Sumidero, *Shafer 13378* (A, BM, NY, US); Baños San Vicente, *Britton et al. 7314* (NY, US); Viñales, *Killip 13583* (US); Viñales, Mogote de Santo Tomás, *Arias s.n.* (MO); Sierra de Viñales, *Ekman 16539b* (NY, US).

Anthurium vinillense Bunting, Phytologia 64: 462–463. 1988. TYPE: Venezuela. Amazonas: Dept. Río Negro: hilly savanna, Serranía de Vinilla, ca 20 km SW of Mavaca, 2°26′N, 65°20′W, ca. 420 m, *Huber 6201* (holotype, VEN, isotypes, MO, NY). Figure 354.

Description based on dried material only. Usually terrestrial, sometimes epilithic, to ca. 35 cm tall; internodes short; cataphylls narrowly triangular, 5.5 cm long, narrowly acute at apex, drying reddish brown, the uppermost persisting semi-intact, promptly weathering to fibers. *Leaves* erect; petioles 3.2–5.2 cm long, less than 5 mm diam., C-shaped, weakly sulcate with raised margins and an obscure medial rib adaxially, rounded abaxially; sheathing to midway; 5.6–7.3 × as long as petiole; geniculum scarcely thicker and drying darker than petiole, ca. 0.5 cm long; blades coriaceous, elliptic to obovate-elliptic, acuminate at apex (the acumen short, with margins thickened and turned upward), acute to obtuse at base, 16–28 cm long, 4.3–9.5 cm wide, broadest at or slightly above the middle, 3–3.6 × longer than broad; upper surface inconspicuously punctate, lower surface densely dark glandular-punctate (those glands ca. 1.5 mm diam.); both surfaces drying yellow-green, glossy; midrib convexly raised on both surfaces; primary lateral veins 5–8 per side, departing midrib usually at ca. 10° angle from midrib, then spreading at 40° angle, moderately straight or weakly to markedly arcuate to the margin; collective vein lacking or arising from second to last primary lateral vein. *Inflorescences* erect, longer than leaves; peduncle 27–39 cm long, 5.6–7.3 × as long as petiole; spathe twisted, green, linear-lanceolate, to 6 cm long, 1 cm wide, thickened at base, inserted at 30° angle on peduncle, acuminate at apex (the acumen inrolled), decurrent for 7–10 mm at base, promptly drying and ultimately deciduous or nearly so; prominently and closely veined adaxially, densely purple-punctate adaxially (on surface and veins) with pale, short raphide cells; stipe 4–6 mm long; spadix green tinged with maroon, scarcely tapered at apex, erect, to 10.5 cm long, 5–6 mm diam.; flowers rhombic, 2–2.3 mm long, 1.6–1.9 mm wide, the sides moderately straight; 7–9 flowers visible in principal spiral; tepals obscurely pale-punctate; lateral tepals 1.6–1.9 mm wide, the inner margins broadly rounded, the outer margins 2-sided; pistils not at all exserted; stigma linear, 0.6 mm long; stamens held just above tepals in a tight cluster, inclined over and obscuring the pistil; anthers 0.4 mm long, 0.7 mm wide; thecae ovoid, moderately divaricate. *Infructescence* with spathe withered, bearing berries in the basal fourth only; berries dark wine-red toward apex, paler to whitish in lower part, to 7 mm diam.; seeds 2 per berry, slightly flattened, 3.8 mm long, 2.6 mm diam.

Anthurium vinillense is endemic to Venezuela, known only from the type locality in the Serranía del Vinilla in southern Amazonas.

This species is characterized by its small size, short petioles that are sheathed to half their length, glandular-punctate, elliptic to subelliptic, coriaceous blades which dry with prominently raised reticulate veins on both surfaces, and dark wine-red berries.

Anthurium vinillense is closely related to both *A. xanthoneurum* and *A. bonplandii* subsp. *guayanum* and will perhaps prove to be only a subspecies of *A. bonplandii*. The type locality of *Anthurium vinillense* is a relatively remote and poorly explored area. *Anthurium bonplandii* subsp. *guayanum* has been collected in numerous localities to the north and south of the Serranía del Vinilla, but plants of subsp. *guayanum* are much larger and never have the reticulate veins prominently raised.

VENEZUELA. AMAZONAS: Dpt. Río Negro, ca. 20 km SW of Mavaca, 420 m, 2°26'N, 65°20'W, *Huber 6201* (MO, NY, VEN).

Anthurium wagenerianum K. Koch & Bouché, Ind. Sem. Hort. Berol. App. 7. 1853. TYPE: Venezuela. Caracas, *Wagener s.n.* (Type destroyed; cultivated at Vienna; Schott illustrations 542–544 serve as lectotype). Figures 335–338.

Anthurium huequeense Bunting, Phytologia 60(5): 295. 1986. TYPE: Venezuela. Cultivated at Jard. Bot. Maracaibo, originally collected by van der Werff in Falcón: Dtto. Zamora, delta of Rio Hueque, Coro–Morón Hwy., 100 km E of Coro, *Bunting 7704* (holotype, NY, isotypes, MO, VEN).

Terrestrial, often epilithic; stem short, 1.5–3.5 cm diam.; roots moderately numerous, ascending to descending, greenish gray, often fuzzy or woolly-pubescent, thick, blunt, to 15 cm long, 2–7 mm diam.; cataphylls subcoriaceous, broadly lanceolate, 3–7 cm long, acute at apex, yellowish green weakly tinged with red, drying brown to reddish brown, usually with visible raphide cells, persisting semi-intact, eventually as coarse linear fibers. *Leaves* erect to erect-spreading; petioles (4)6–25 cm long, drying (1)4–10 mm diam., subquadrangular to trapezoidal or D-shaped, flattened to broadly sulcate to obtusely V-sulcate adaxially, with the margins sharply to bluntly raised, rounded to 3-ribbed abaxially; geniculum paler and thicker than petiole, becoming fissured transversely with age, 0.5–1.5 cm long; blades subcoriaceous to coriaceous, narrowly to broadly elliptic or oblanceolate, acute to obtuse or rounded at apex (the acumen briefly cuspidate), acute to attenuate at base, (8)17–70 cm long, (4)6–30 cm wide, broadest at or above the middle, the margins conspicuously wavy, minutely undulate when dried; both surfaces matte to weakly glossy to semiglossy, dark to medium green above, slightly paler below, with linear raphide cells conspicuous on drying (especially below), occasionally with pustules on either surface; midrib flat to weakly angular at base, becoming narrowly acutely raised toward the apex above, prominently 3-ribbed to convexly raised at base, becoming convexly raised toward the apex below; primary lateral veins (3)4–7 per side, departing midrib at 30–65° angle, ± straight then arcuate close to margin, prominently and narrowly convex above, less narrow and prominent below; interprimary veins few, especially in juvenile leaves, obscure; tertiary veins sunken to obscure above, weakly raised and darker than surface below; collective vein arising from near the apex, weakly sunken above, somwhat raised and darker than surface below, 2–10 mm from margin. *Inflorescences* erect to spreading, shorter than leaves; peduncle 8–54 cm long, 4–6 mm diam., (1)1.5–3 × as long as petiole, medium green tinged reddish at base, terete; spathe spreading to reflexed, subcoriaceous to moderately coriaceous, plain green to tinged with red-purple, lanceolate to broadly lanceolate, sometimes ovate, 2–6 cm long, 0.5–2 cm wide, broadest at or near the middle, inserted at 80–90° angle on peduncle, acute to acuminate at apex (the acumen inrolled, 2–5 mm long), obtuse to decurrent at base; spadix creamy to green to gray-green at anthesis, becoming red to purple-violet post-anthesis, cylindroid to weakly tapered, sessile or stipitate 1–25 mm, mostly erect, sometimes slightly curved, held at 130–180° angle from peduncle, (1.5)4–12.5 cm long, 5–12 mm diam. midway; flowers mostly square to occasionally 4-lobed, (1.2)1.6–3.1 mm in both directions, the sides straight to smoothly sigmoid; 5–10 flowers visible in principal spiral, 5–8 in alternate spiral; tepals matte, very minutely papillate, with pale protuberances when dried; lateral tepals 0.8–1.8 mm wide, the inner margins straight to convex, often broadly so, the outer margins 2-, occasionally 3-sided; pistils early-emergent, semiglossy, densely and minutely papillate, bright green; stigma linear to ellipsoid, 0.2–0.3 mm long; stamens emerging from the base, the laterals preceding the alternates by 6–13 spirals, the 3rd preceding the 4th by 3–6 spirals, held above the tepals in a circle around the pistil; filaments not exserted when dried; anthers creamy, sometimes tinged with pink, 0.6–0.9 mm long, 0.6–1 mm wide; thecae oblong-ellipsoid, not at all or only slightly divaricate; pollen faintly spicy scented, pale yellow to creamy white fading to white. *Infructescence* spreading to pendent; spathe persisting, green; spadix to 13 cm long, to 2 cm diam., with berries scattered throughout; berries red to purple, oblong to obovoid, acute to mammilliform at apex, 6–8.2 mm long, 3.2–4.5 mm diam.; pericarp thickened, with numerous raphide cells; seeds 2 per berry, broadly ellipsoid or oblong-ellipsoid, 3.2–5 mm long, 1.6–3 mm diam., 0.8–1.6 mm thick, attached to carpel wall at radicle end by a thick strand of fibers running midway down the carpel to the basal end of the fruit.

Anthurium wagenerianum is known from the Cordillera Costal in Venezuela and from Curaçao in the Netherlands Antilles. It is found on steep, rocky cliffs and dry slopes, rarely reported from primary forest, from sea level to 600 m in tropical moist, tropical dry, and premontane dry forest life zones.

This species can be distinguished by the blades, which dry with pale raphide cells conspicuously visible under low magnification and with conspicuous undulations along the margin, and by the petiole, which is more or less quadrangular, adaxially flat to broadly sulcate, and abaxially usually squared or 3-ribbed. The spathe and spadix of *A. wagenerianum* are both quite small, and the spadix is cream-colored to green at anthesis, sometimes with the tepals fainty tinged with purple.

Anthurium wagenerianum is deceptively similar to *A. crassinervium* in habit, range, and leaf shape. The above-mentioned blade and petiole characteristics, however, aid in identification of dried specimens. Furthermore, dried abaxial leaf surfaces of *A. wagenerianum* do not demonstrate the highly light-reflective character nor the readily distinguished concentric epidermal cell pattern of *A. crassinervium* (see that species for more details). The spathe and spadix of *A. wagenerianum* are, moreover, quite short and stout in comparison with those of *A. crassinervium*. Both species have red berries basally attached to the spadix by tepalar fibers at maturity. *Anthurium wagenerianum*, however, has a drier berry upon rehydration, its seeds being attached to the inner carpel wall at its apical end by a thick strand of fibers running midway down the carpel toward the basal end of the fruit, as in *A. bonplandii*. *Anthurium crassinervium*, in contrast, has seeds attached to the rehydrated berry by a mucilaginous substance typically found in fruits of most members of sect. *Pachyneurium*. Another feature separating *A. wagenerianum* from *A. crassinervium* are the pistils which are earlier emergent at anthesis in *A. wagenerianum* than is true of *A. crassinervium*.

Bunting et al. 11993 is included in *A. wagenerianum* with reservation. It is reportedly an epiphyte from a wet forest life zone, with an adaxially convex petiole. All three of these characteristics conflict with the norm for *A. wagenerianum*. Its lower leaf epidermal characteristics, stubby spadix, and short spathe suggest that its placement in this species is, however, correct.

Anthurium huequeense was compared by Bunting (1986) with *A. crassinervium*, but is in fact conspecific with *A. wagenerianum* and cannot be distinguished from typical material of the latter.

NETHERLANDS ANTILLES. CURAÇAO: Christoffel Mountain, *Tuinen 79GR00095* (K). VENEZUELA. CARABOBO: Puerto Cabello, 100 m, *Curran & Haman 1140* (GH, US); Las Trincheras–El Cambúr, 1.5 km N of bridge over Río Trincheras, N edge of Las Trincheras, 0–500 m, 10°21′N, 68°05′W, *Croat 54543* (CAS, F, MO, RSA, SEL, US), *54544* (GH, K, MO, NY); Puerto Cabello–Valencia, El Cambúr, *Bunting 2848, 2854* (NY); 100–300 m, *Bunting 13512* (cultivated at MO). DISTRITO FEDERAL: W of Naiguatá, 0 m, *Gentry & Berry 14735* (MO); Río Las Caracas, above town of Las Caracas, 100 m, *Croat 21620* (MO). FALCÓN: Sierra de San Luis, Piedra de Agua, 600 m, 11°08′N, 69°40′W, *Liesner et al. 7634* (MO); Dtto. Acosta, Via Pilancones, 6 km of Mirimire, *Ruiz & Rondon 3726* (MY); Dtto. Colina, Río Ricoa, S of Las Dos Bocas, 200 m, 11°19′N, 69°24′W, *Steyermark & Gonzales 113632* (MO); Dtto, Zamora, Delta of Río Hueque, Coro–Morón, 100 km E of Coro, 50 m, *Bunting 7704* (cultivated; originally collected as *van der Werff 3522*) (MO, NY, VEN), *Croat 71734* (MO). MIRANDA: Carenero–Chirimena, 2 km NW of Carenero, 0–5 m, *Steyermark & Bunting 102313* (MO); Río Chupaquire, new road 1 km S of main road, S of El Guacuco, 7 km E of Cupira, 0–150 m, 10°09′N, 65°38′W, *Liesner & Gonzalez 11906* (MO, WIS), 11917 (MO); Dtto. Brion, Laguna Grande, 0–30 m, 10°33′N, 66°04′W, *Berry et al. 3740* (MO). ZULIA: Dtto. Mara, Río Guasare, near Destacamento Guasare No. 1 (La Yolanda), abajo del Destacamento, 200–250 m, *Bunting et al. 11993* (MO).

Anthurium watermaliense hort. ex L. Bailey & Nash, Stand. Cycl. Hort. 1:303. 1922. TYPE: Colombia. Not seen, introduced into horticulture via Watermall, Belgium. Neotype: Panama. Bocas del Toro: Changuinola–Almirante, Railroad Station Milla 7.5, less than 100 m, *Croat 38129* (lectotype MO-2820846; isoelectotypes, CAS, F, MEXU, NY, PMA, S, SEL, UC, US). Figures 333, 334.

Terrestrial; stem to 25 cm long, (1)1.5–3 cm diam.; roots numerous, descending, velutinous, 3–4 mm diam.; cataphylls thin, 4.5–14 cm long, obtuse to acute at apex, persisting as coarse linear fibers. *Leaves* erect-spreading; petioles (12)25–60(88) cm long, ca. 4–5 mm diam., subterete, flattened to slightly and narrowly sulcate with blunt to rounded margins adaxially, rounded abaxially; geniculum, 1–1.5 cm long; blades moderately coriaceous, ovate-triangular, long-acuminate at apex, deeply lobed at base, 21–60 cm long, (14)20–40 cm wide; anterior lobe 20–45 cm long; the posterior lobes mostly oblong, (7)14–26 cm long, (3.5)5–10(16) cm wide, rounded at apex; sinus parabolic to hippocrepiform; both surfaces semiglossy; midrib convexly raised above and below; basal veins 5–8 pairs, 2nd through 8th coalesced

4.5–8 cm, prominulous above and below; posterior rib mostly naked, weakly turned up on outer margin; primary lateral veins 4–8 per side, departing midrib at 40–45° angle, prominulous in grooves above, prominulous below; tertiary veins conspicuously raised below when dried; collective vein arising from 1st or 2nd basal vein, raised above and below, equally as prominent as primary lateral veins when dried, 3–6 mm from margin. *Inflorescences* spreading, shorter than leaves; peduncle (12)25–60(75) cm long, 3–7 mm diam., 0.5–1.5 × as long as petiole; spathe erect to reflexed, subcoriaceous, usually dark violet-purple, sometimes green, lanceolate to ovate-lanceolate, 5–15(21) cm long, (1.5)2–6(8.5) cm wide, inserted at 75° angle on peduncle, long-acuminate at apex, acute to rounded (rarely cordate) and conspicuously decurrent at base; stipe 0.3–3 cm long; spadix white to greenish, yellow or purple, tapered, 7–19 cm long, 5–10 mm diam. near base, 2–5 mm diam. near apex; flowers rhombic to 4-lobed, 1.5–3.4 mm long, 1.8–3.1 mm wide, the sides straight to jaggedly sigmoid; 5–12 flowers visible in principal spiral, 6–16 in alternate spiral; tepals matte, punctate; lateral tepals 1.5–2.2 mm wide, the inner margins convex to ± straight; pistils raised, protruding beyond the stamens at anthesis, glossy, weakly exserted just before stamens emerged, dark green; stigma narrowly ellipsoid, ca. 0.5 mm long, droplets appearing 2–3 days before stamens emerge; stamens emerging rapidly from the base or sometimes in a scattered pattern throughout, held erect above the tepals; filaments translucent, exserted, 0.3–0.4 mm long, 0.6 mm wide; anthers creamy white, 0.9 mm long, 0.9–1 mm wide; thecae ellipsoid, divaricate; pollen white. *Infructescence* with spadix to 22 cm long, ca. 2 cm diam., bearing berries in the basal portion only; berries yellow to usually orange, ovoid to obovoid, shortly beaked at apex, 10–15 mm long, ca. 4–5 mm diam.

This species is known from Costa Rica and Panama, between sea level and 2,400 m; most collections have been made at about 750 m in premontane and lower montane rainforest. Populations occur near sea level in tropical moist and premontane wet forest. The species is extremely variable, especially in leaf size and shape, and spathe and spadix color.

Anthurium watermaliense can be recognized by its ovate-triangular leaf blades with pronounced posterior lobes (a unique feature within the section), its broad, decurrent and frequently dark purple spathe, tapered spadix with exserted stamens, and usually orange berries.

This species is most easily confused with specimens of *Anthurium cotobrusii*, which have unusually long posterior lobes, but the latter species differs in having the pistils shorter than the stamens at anthesis and stamens that do not persist exserted.

Anthurium watermaliense might also be confused with *A. standleyi*. See discussion of that species for distinguishing characters.

Although originally reported to have come from Colombia, no wild collections from present-day Colombia are known. Since Colombia encompassed Panama at the time of its introduction, it is believed that *A. watermaliense* was originally collected in Panama and may never be found in Colombia. In Panama, it has been found no further east than western Veraguas.

WITHOUT LOCALITY: *Drake 219* (P). COSTA RICA: WITHOUT FURTHER LOCALITY: *Lankester 349-49* (K). ALAJUELA: Monteverde, Chomogo trail and Refugio El Valle, 1,600 m, *Kennedy & Guindon 3799* (MO). CARTAGO: Palo Verde, beyond Quebrada Cangreja, 1,500 m, *Luteyn & Wilbur 4376* (MO); SE of Platanillo (Tsipiri), Raiz de Hule Camino, 1,200–1,300 m, *Croat 36713* (MO, PMA); 4.5 km S of bridge on Agua Caliente on Lourdes, ca. 8 km S of Cartago by air, Finca El Chaparral, 1,500 m, 9°49′N, 83°55′W, *Liesner & Judziewicz 14612* (MO); Quebrada Cangreja, 3 km S of Pan American Hwy., ca. 6 km S of Cartago by air, 1,620–1,650 m, 9°46′N, 83°57′W, *Liesner & Judziewicz 14455* (B, CR, MO, NY, RSA, WISC; Río Reventazón, CATIE, 3 km E of Turrialba "Los Espaveles" nature trail, 525–600 m, 9°54′N, 83°39′W, *Liesner et al. 15326* (MO); Tapantí Reserve, 1,400–1,700 m, *Goméz 19262* (MO). HEREDIA: Braulio Carrillo Park, Zurquí, 1,700–2,000 m, *Goméz 20220* (B, CR, K, MO, RSA); Cerro Zurquí, southern slope, 5 km N of San Luis Norte, 1,800 m, 10°03′N, 84°02′W, *Stolze 1548* (F, MO); Río San Rafael, Atlantic slope of Volcán Barva, 1,500 m, 10°13′N, 84°05′W, *Grayum 7021* (MBM, MO); between Río San Fernando and Río Sardinal, Atlantic slope of Volcán Barva, 1,850–1,880 m, 10°12′N, 84°06.5′W, *Grayum 7342* (MO). LIMÓN: Puerto Viejo de Cahuita–Manzanillo at Punta Mona, Panama border, 0–50 m, *Taylor & Skotak 4435* (DUKE, MO), *4529* (DUKE); range of hills 2 km S of Manzanillo de Talamanca, E of Quebrada Hone Wark, 190 m, 9°37′N, 82°39.5′W, *Grayum et al. 4393* (MO); Cordillera de Talamanca, Río Madre de Dios–Río Barbilla, Quebrada Cañabral, 280–400 m, *Grayum et al. 8839* (CR, MBM, MO); Reserva Biol. Hitoy Cerere Valle del Río La Estrella, 400 m, 9°40′15″N, 83°03′20″W, *Herrera & Chacón 2356* (CM, CR, MO); SE of Lago Dabagri, Telire, *Goméz et al. 23225* (CR, MO); Portete, 10 km N of Puerto Limón, 3 m, *Lent 347* (MO); Siquirres, Las Brisas de Pacuarito, 300 m, *Gomez et al. 23396* (MO, NY, US); Cerro Pirripli, just SE of Puerto Viejo de Talamanca, along trail from cemetery, 100–150 m, 9°39′N, 82°45′W, *Grayum 3631* (CR, MO, RSA); Río Catarata, Bribrí, less than 50 m, *Croat 43224* (CM, MO); Río Sixaola, 10–

50 m, 9°35′N, 82°53′E, *Burger et al. 10444* (F, MO). SAN JOSÉ–HEREDIA: Cerro Zurquí, southern slope, end of Calle Zurquí, 1,800–2,000 m, *Almeda & Nakai 3706* (MO); Río Para Blanca, Cerro de Zurquí, 1,600–1,800 m, 10°03′N, 84°01′W, *Burger et al. 9342* (MO). SAN JOSÉ: Carrillo Station, 700 m, *Gomez et al. 21168* (MEXU, MO). PANAMA. BOCAS DEL TORO: Changuinola–Almirante, Railroad Station at Milla 7.5, less than 100 m, *Croat 38129* (CAS, F, IBE, K, MEXU, MO, NY, PMA, RSA, S, SEL, UC, US, VDB, W, WIS), *Croat & Porter 16246* (MO); Criollo (just above Buena Vista)–Quebrada Higuerón, Chiriquí trail, *Kirkbride & Duke 784* (MO); 15 km S of town of Changuinola, Changuinola–1 dam site, 300–500 m, *Antonio 3146* (MO). CHIRIQUÍ: Quebrada Hondo–Continental Divide, on Calderas–Chiriquicito Trail, *Kirkbride & Duke 960* (MO); Boquete Region, Palo Alto, 4.5 mi. NE of Boquete, *Hammel 7542* (MO); Cerro Colorado, 1,200–1,500 m, *Croat 33265* (F, MO, SEL, US, VEN), *Folsom & Collins 1754, 1764* (MO), *Folsom et al. 4840* (MO), *Mori & Dressler 7849, 7852* (MO), *Sullivan 359* (MO); Cerro Colorado mine area, from Chamí station to 9 mi. along rd., 1,100–1,750 m, 8°35′N, 81°54′W, *Hammel & Trainer 14977* (MO); Fortuna Road, Gualaca–Fortuna Dam, 5.9 mi. NW of Los Planes de Hornito, 1,370 m, 8°43′N, 82°15′W, *Croat 49898* (MO). VERAGUAS: Santa Fe Region, N of Escuela Agrícola Alto Piedra, 700–900 m, *Croat 49035* (MO), *Croat & Folsom 33958* (CM, F, MO), *Folsom 2994* (MO), *Mori & Kallunki 2563* (MO); 6–7 km W of Santa Fe, 900 m, *Nee 9717* (MO, PMA).

Anthurium willifordii Croat, sp. nov. TYPE: Peru. Loreto: Napo River, Explorama Camp, on Río Sucusari, below 200 m (originally collected by Jack Williford), *Croat 61087* (holotype, MO 3244489; isotypes, B, K, NY, USM). Figures 339, 340.

Planta epiphytica; internodia brevia, 1–2 cm diam.; cataphyllum persistens intactum mox deciduum; petiolus quadrangularis ad trapeziformis, interdum subteres, 2–4.5 cm longus, 4–5 mm diam.; lamina oblanceolata aut oblanceolata-elliptica, (14)18–50 cm longa, 5.5–16 cm lata; nervis primariis lateralibus 6–13 utroque; pedunculus 2.5–9 cm longus; spatha erecta, atropurpureus, navicularis, 2.3–4 cm longa, 1–2 cm lata; spadix dilute purpureo-violaceum aut griseo-purpureum, cylindroideus, 1.7–4 cm longus, 2–5 mm diam.; baccae magentae.

Epiphytic; stem short, 1–2 cm diam.; roots numerous, dense, spreading to descending, pale to medium green, smooth, bluntly tapered, moderately elongate, 3–4 mm diam.; cataphylls subcoriaceous, broadly triangular, 1.5–5 cm long, acute at apex, pale yellowish green, drying brown, persisting intact, soon deciduous. *Leaves* spreading; petioles 2–4.5 cm long, 4–5 mm diam., erect-spreading to spreading, quadrangular to trapezoidal, sometimes subterete, with a medial rib and the margins prominently raised adaxially, sharply 3–5-ribbed abaxially, the surface slightly pale-speckled; geniculum becoming reddish tinged, 0.4–0.7 cm long; blades subcoriaceous to moderately coriaceous, oblanceolate to oblanceolate-elliptic, obtuse, minutely apiculate at apex, obtuse to rounded at base, (14)18–50 cm long, 5.5–16.5 cm wide, usually broadest above the middle, the margins sometimes undulate; upper surface matte-velvety, moderately quilted, medium green, lower surface velvety with conspicuous crystalline cells, slightly paler and often tinged with red; both surfaces drying brown to grayish brown; midrib prominently acute at base, becoming narrowly raised toward the apex above, prominently acute and tinged with reddish below; primary lateral veins 6–13 per side, departing midrib at 50–70° angle, straight, flat to weakly raised above, weakly raised and darker than surface and tinged with red below, drying slightly raised above and below; interprimary veins less prominent than primary lateral veins, darker than surface below; tertiary veins slightly darker than surface below, drying weakly raised; reticulate veins obscure; collective vein arising from near the base or in upper third of blade, weakly sunken to flat above, weakly raised and darker than surface below, equally as prominent as primary lateral veins, 4–10 mm from margin. *Inflorescences* erect; peduncle 2.5–9 cm long, 2–3 mm diam., 1.2–3 × as long as petioles, green faintly tinged purplish, terete with obscure ridge; spathe erect, subcoriaceous, dark purple to purplish violet (B & K red-purple 2/5), ovate-elliptic, navicular, 2.3–4.7 cm long, 1–2 cm wide, broadest in the lower third, cuspidate-acuminate at apex, acute and weakly decurrent at base; spadix reddish (B & K red 7/10) to faintly purplish violet or grayish purple, very short, cylindroid, erect, 1.7–4.7 cm long, 2–6 mm diam.; flowers rhombic and weakly 4-lobed, 1–1.5 mm long, 1.5–1.7 mm wide, the sides ± straight parallel to spiral, jaggedly sigmoid perpendicular to spiral; 8–9(14) flowers visible in principal spiral, 17–21 in alternate spiral; tepals matte, densely and minutely papillate; lateral tepals 0.5–0.9 mm wide, the inner margins rounded to bluntly 3-sided, the outer margins 2–3-sided to shield-shaped and 4-sided; pistils raised, purple, much darker than the tepals; stigma slitlike, 0.2–0.3 mm long; stamens emerging from near the middle, lateral stamens emerging to ⅘ the distance to the apex before alternates emerge at lower ⅓ of spadix; anthers white, 0.4–0.5 mm long, 0.4–0.5 mm wide, contiguous at the surface of the tepals; thecae narrowly ovoid, conspicuously divaricate; pollen yellow, fading to white. *Infructescence* with berries scattered throughout; berries obovoid, magenta, rounded at apex.

Anthurium willifordii is endemic to Loreto Department in Peru, where it has been collected once in the vicinity of the Explorama Camp on the Río Sucusari, a tributary of the Río Napo, at less than 200 m. It was found here as an epiphyte in a tropical moist forest life zone.

This species is a very distinctive one, the chief characters being the short, stubby spadix on a short peduncle and the quilted leaf blades, which are matte above, velvety and frequently tinged red below. The petioles are of variable cross-sectional shape: quadrangular to trapezoidal or sometimes subterete; they are always sharply 3–5-ribbed abaxially.

No other species is likely to be confused with *A. willifordii,* and only *A. superbum* and *A. reflexinervium* share the character of quilted, velvety or red-tinged leaf blades.

The new species is named in honor of Jack Williford, of Brandon, Florida, who originally collected live plants along the Río Sucusari.

PERU. LORETO: Río Napo, Explorama Camp, on Río Sucusari, below 200 m, originally collected by Jack Williford, *Croat 61087* (B, K, MO, NY, USM).

Anthurium wurdackii Bunting, Acta Bot. Venez. 10: 279. 1975. TYPE: Venezuela. Amazonas: Cerro Yapacana, 3°45'N, 66°45'W, 825 m, *Steyermark & Bunting 103099* (holotype, VEN; isotypes, MO, MY, NY, US). Figure 341.

Description based on dried material only. Terrestrial or epilithic; stem short, stout, growing horizontally, 1.5–4 cm diam.; cataphylls thick, ca. 4–7 cm long, dark brown, persisting ± intact or weathering into fine linear fibers. *Leaves* erect to spreading; petioles 22–55 cm long, 5–8 mm diam., subterete, somewhat flattened and narrowly sulcate with rounded margins adaxially, rounded abaxially; geniculum 1–1.5 cm long; blades thickly coriaceous, broadly ovate-elliptic to somewhat broadly lanceolate in larger blades, acute to obtuse at apex, shallowly cordate at base, 28–53 cm long, 10.5–26 cm wide, broadest at or just below the middle; sinus broadly and shallowly arcuate; upper surface glossy, dark green, lower surface; midrib flat at base; becoming convexly raised toward apex; basal veins 3–4 pairs, prominently arcuate-ascending, usually merging with the margin, at least the first vein extending to near or above the middle of the blade; primary lateral veins 3–4 per side, departing midrib at 40–60° angle, slightly arcuate, steeply ascending, raised above and below; interprimary veins few, less conspicuous than primary lateral veins; tertiary veins sunken above, raised above and below; collective vein arising in the upper half of the blade or absent. *Inflorescences* longer than leaves; peduncle (44)55–81 cm long, ca. 4–7 mm diam., 1–2× as long as petiole; spathe erect-spreading at anthesis, becoming reflexed to recurled, subcoriaceous, green tinged with maroon at apex at anthesis, becoming purple, lanceolate, (6.5)8–14.5 cm long, 1.5–2.5 cm wide, decurrent for 1.5–2 cm at base; spadix maroon, stipitate to 7–13 mm, narrowly tapered, 6.5–18 cm long, 6–7 mm diam. near base, 3–4 mm diam. near apex; flowers rhombic, 2.7 mm long, 2.9 mm wide, the sides straight to weakly sigmoid; 8 flowers visible in principal spiral, 6 in alternate spiral. *Infructescence* with spathe persisting; spadix 7–21 cm long, 1.5–2 cm diam.; berries white, maroon at apex, ca. 8 mm diam.

Anthurium wurdackii is known only by two collections from Amazonas, Venezuela, on Cerro Yapacana at 825 m in premontane wet forest, and on Cerro Neblina at 780 m in lower montane moist forest.

This species is an atypical member of the section and can be recognized by its subterete petioles, coriaceous, broadly ovate-elliptic leaf blades that are shallowly cordate at the base and have three to four pairs of basal veins and steeply ascending, mostly free-ending primary lateral veins. Also characteristic are the long peduncle, maroon, sharply tapered spadix, and whitish berries that are maroon at the apex.

Anthurium wurdackii is not closely related to any other species in sect. *Pachyneurium.* In leaf texture, it is most similar to *A. bonplandii* subsp. *bonplandii* or subsp. *guayanum,* but those differ in lacking basal veins and having oblanceolate to elliptic leaf blades that are attenuate to obtuse at the base.

VENEZUELA. AMAZONAS: Cerro Yapacana, 825 m, *Steyermark & Bunting 103099* (MO, MY, NY, US, VEN); Dpt. Río Negro, Cerro Neblina, Camp IV, 15 km NNE of Pico Phelps, north branch of river in canyon, 780 m, 0°51'N, 65°57'W, *Liesner 16664* (B, MO).

Anthurium xanthoneurum Bunting, Phytologia 60(5): 298. 1986. TYPE: Venezuela. Amazonas: Dept. Río Negro, Cerro Aratitiyope, ca. 70 km SSW of Ocamo, 900 m, 2°10'N, 65°34'W, *Steyermark et al. 130054* (holotype, NY; isotypes, MO, VEN). Figure 342.

Description based on dried material only. Epilithic; stem short, ca. 2.5 cm diam. *Leaves* with petioles less than 10 cm long; geniculum thicker than petiole, 2.5 cm long; blades thickly coriaceous, oblanceolate-elliptic, obtuse at apex, obtuse to narrowly rounded at base, 30–55 cm long, 8.5–15 cm wide, broadest above the middle, the margins prominently revolute; upper surface semiglossy and weakly quilted, lower surface paler, matte and with conspicuous brown glandular punctations, yellow-green; midrib convexly raised above, more prominently so below; primary lateral veins 8–10 per side, departing midrib at 30–40° angle, weakly arcuate to the margin, convexly raised above in moderately deep grooves, conspicuously raised below; interprimary veins absent; tertiary veins prominulous, especially on the upper surface; collective vein absent. *Inflorescence* with peduncle 50 cm long, ca. 6 mm diam.; spathe unknown; spadix (post anthesis) brownish green, long-tapered, erect, 24 cm long, ca. 8 mm diam. near base, ca. 4 mm diam. near apex, broadest at the base.

Anthurium xanthoneurum is known only from the type collection from Cerro Aratitiyope in Amazonas, Venezuela, at 990 m in a premontane rainforest life zone.

This species is distinguished by its heavily coriaceous leaf blades with steeply ascending primary lateral veins, and its slender, long-tapered spadix.

Anthurium xanthoneurum is closely related to *A. bonplandii* and especially resembles subsp. *guayanum*. That taxon differs, however, in having mostly broader leaf blades with the primary lateral veins ascending at a wider angle.

VENEZUELA: AMAZONAS: Dpt. Río Negro. Cerro Aratitiyope, 70 km SSW of Ocamo, streams feeding Río Manipitare, 990–1,670 m, 2°10′N, 65°34′W, *Steyermark et al. 130054* (NY, VEN).

EXCLUDED SPECIES

Anthurium aduncum (Vell. Conc.) Schott, Prod. Aroid. 478. 1860. TYPE: Brazil. Illustration in Vellozo (1825). (Fl. Flum. Tab. 124 serves as the type.)

This species is based on an illustration (*Pothos aduncus*) in Vellozo's Flora Fluminensis (1825). Schott (1865) transferred it to *Anthurium* and included it in his section *Pachyneurium*. Engler (1905) placed the name among his "Species dubia." There are only two *Pachyneurium* species known from southern Brazil, *A. coriaceum* G. Don in Sweet and *A. solitarium* (Vell. Conc.) Schott, and *A. aduncum* does not look remotely like either of them. The narrow blades with numerous veins indicate that it is most likely a member of sect. *Urospadix*. Its exact affinities may never be known, since that group has many similar species.

Anthurium agnatum Schott, Oesterr. Bot. Z. 8: 181. 1858. TYPE: Nicaragua. *Oersted s.n.* Type destroyed. (Field Museum photo 29807 serves as the type.)

This species, included in sect. *Pachyneurium* by both Schott (1860) and Engler (1905), was based on a sterile *Oersted* collection from Nicaragua. Although reported by Engler to be at Copenhagen, no such specimen exists there today. This may have been in error, because an *Oersted* collection bearing the name *Anthurium agnatum* was photographed (Field Museum 29807) at the Vienna herbarium (W), before the latter was destroyed during World War II. Schott also prepared an illustration of the same specimen (Schott illustration 468, Fiche 15:610). The photograph of the specimen and the Schott illustration are all that exist today.

The leaf blades of *Anthurium agnatum* are shaped like those of *A. spathiphyllum* N. E. Br., but have fewer than 10 primary lateral veins (vs. 20–30 for the latter). It may be an unusual specimen of *A. bradeanum* Croat & Grayum, a species similar to *A. spathiphyllum*, but that species, though possessing fewer primary lateral veins, has ovate-elliptic blades less than five times longer than broad. The blades of the *Oersted* collection are narrowly oblanceolate and over six times longer than broad. The unavailability of a specimen for examination of leaf texture, coloration, and venation makes it impossible to identify it with certainty, so it remains a nomen dubium.

Anthurium andicola Liebm., Vidensk. Meddel. Dansk Naturahist. Foren. Kiobenhavn 1: 22. 1849. TYPE: Mexico. Veracruz: Santa María Alpatlahua, 2,500 m, *Liebmann s.n.* (lectotype, K).

Designated as a *Pachyneurium* by Engler (1905), but rejected due to its lack of involute vernation, this species is a member of sect. *Belolonchium* (*A. andicola* Alliance); see Croat (1983).

Anthurium brownii Masters, Gard. Chron. 11. 744. 1876. TYPE: Colombia. Valle: vic. Buenaventura, *Wallis s.n.* (type, K).

This species was included in sect. *Pachyneurium* by Engler (1905), but it lacks involute vernation. It is possibly a member of sect. *Belolonchium.*

Anthurium cartilagineum (Desf.) Kunth, Enum. Pl. 3: 79. 1879. TYPE: Venezuela. (Schott Drawings 678-680 serve as the type.)

Included in sect. *Pachyneurium* by Engler (1905), but lacking involute vernation. Section unknown.

Anthurium cordatum (Willd.) G. Don in Sweet, Hort. Brit. 633. 1839. TYPE: West Indies, Willdenow Herbarium Cat. Nr. 3101 (type, B).

Included in sect. *Pachyneurium* by Engler (1905), but lacking involute vernation. Section unknown.

Anthurium cuspidatum Masters, Gard. Chron. I. 428. 1875. TYPE: Colombia?, Hort. Vietch, Jan. 1875 (K).

This species was erroneously included under sect. *Pachyneurium* in my revision of *Anthurium* for Mexico and Middle America (Croat, 1983), based on a misidentified plant with involute vernation. It is a member of sect. *Polyneurium.*

Anthurium grandifolium (Jacq.) Kunth, Enum. Pl. 3: 77. 1841. TYPE: Jamaica (erroneously reported as from Venezuela), Jacquin type not seen. (Willendow Herbarium specimen 3102 (B) might serve as the type if the Jacquin specimen is not located.)

This species was included in sect. *Pachyneurium* by Engler (1905), but rejected due to the presence of supervolute rather than involute vernation. Section unknown.

Anthurium hacumense Engl., Bot. Jahrb. Syst. 25. 363. 1898. TYPE: Costa Rica. Puntarenas: of Río Hacum, near Buenos Aires, 250 m, *Tonduz 6536* (holotype, B; isotypes, BR, CR).

Like *Anthurium hookeri* (see below), *A. hacumense* has glandular-punctate blades. Having overlooked the glandular punctations, Engler no doubt placed the species in *Pachyneurium* owing to its large size and rosulate habit; it is a typical member of sect. *Porphyrochitonium.*

Anthurium hookeri Kunth, Enum. Pl. 3: 74. 1841. TYPE: Schott Drawing 517 serves as the lectotype (designated by Mayo 1982).

Though treated as a *Pachyneurium* by both Schott (1860) and Engler (1905), *Anthurium hookeri* does not belong there. It differs from all species of *Pachyneurium* by having supervolute vernation and leaf blades with scalariform secondary venation and glandular punctations on the lower blade surface. It probably belongs to its own section or is an unusual member of sect. *Porphyrochitonium.*

Anthurium lilacinum Bunting, Acta Bot. Venez. 10: 273. 1975. TYPE: Venezuela. Carabobo: headwaters of Río San Gian, above Los Tanques and La Toma, S of Barburata, 750–900 m, *Steyermark 95294* (holotype, VEN; isotype, MY).

Anthurium lilacinum was erroneously reported as a member of sect. *Pachyneurium* by Croat and Lambert (1986). This was based on its rosulate habit and otherwise superficial resemblance to species of this section. Later studies revealed it to lack involute vernation. It is probably a member of sect. *Urospadix.*

Anthurium longispathum Carriere, Rev. Hort. 498. 1888. TYPE: Guadeloupe (based on cultivated collection, no type specimen prepared ?).

The species was treated by Engler (1905) as a *Pachyneurium.* It is a synonym of *Anthurium grandifolium* (Jacq.) Kunth (see that species).

Anthurium maximum (Desf.) Engl., Pflanzenr. IV. 23B(Heft 21): 77. 1905. TYPE: No specimen or illustration pertaining to the type is known.

Anthurium maximum was described by Desfontaines in 1829 in *Pothos.* Schott did not deal with the name at all, but Engler (1879) treated it as a synonym of *A. fontanesii* in his first treatment of *Anthurium.* In his 1905 revision, Engler correctly transferred *Pothos maxima* to *Anthurium* and treated *A. fontanesii* as a synonym of *A. maximum.* Desfontaines' brief description compares the plant with *Pothos crassinervia* Jacq. from which it was said to differ by its larger blade "broadened toward the apex, its longer, sulcate petiole and its longer spadix." Engler may have seen some preserved material of *A. maximum,* perhaps a specimen at the Paris Herbarium prepared by Desfontaines. However, if any such collection ever existed, there is no longer any record of it. Engler's description of *A. maximum* closely matches Schott's original description of *A. fontanesii*, now considered a synonym of *A. crassinervium*, but the vague nature of *A. maximum* precludes making any definitive treatment, and it is treated here as a nomen dubium.

Anthurium michelii Guillaumin, Bull. Mus. Hist. Nat. (Paris) 31: 263. 1925. TYPE: Panama. Bocas del Toro: hills beyond Fish Creek Lagoon, *Wedel 2276* (holotype, P).

This species was erroneously reported as a *Pachyneurium* by Croat (1983), and it was later suggested (Croat, 1986) to be a member of sect. *Urospadix*. However, the latter group is probably restricted to eastern South America and has less conspicuous primary lateral veins. *Anthurium michelii* is not a *Pachyneurium* owing to its supervolute vernation and is perhaps best placed in a new, unnamed section with *A. decurrens* (see discussion in Introduction).

Anthurium seleri Engl., Bot. Jahrb. Syst. 25: 459. 1898. TYPE: Guatemala. Huehuetenango, vic. Chacula, *Seler 2643* (holotype, B).

This species was included in *Pachyneurium* by Engler (1905), but it lacks involute vernation. It is probably a member of sect. *Belolonchium* (*A. andicola* Alliance).

Anthurium tricarinatum Sodiro, Ant. Ecuator. Adiciones 1. 1903. TYPE: Ecuador. Cañar: valley of Río Cañar, *Rimbach 81* (type lost).

Though a well described species, *Anthurium tricarinatum* cannot be assigned with certainty to any known section. Sodiro compared it with *A. leonianum*, a very typical *Pachyneurium*, but he also said the leaves were black-punctate on the lower surface, a feature most closely associated with sect. *Porphyrochitonium*. Engler (1905) treated the species as a *Pachyneurium*, but his description appears to be based on that of Sodiro, and there is no way to be sure that he ever saw a specimen. Unless a specimen or a photograph of the Rimbach specimen becomes available, the species is best considered a nomen dubium.

Anthurium weberbaueri Engl., Pflanzenr. IV. 23B(Heft 21): 81. 1905. TYPE: Peru. Sandia, 2,100–2,300 m, *Weberbauer 543* (holotype, B; isotype, G).

This species was included in *Pachyneurium* by Engler (1905), but belongs in sect. *Digitinervium* by virtue of its scalariform veins and glandular punctations.

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APPENDIX 1. Taxonomic status of species included in Schott's grex *Pachyneurium* (1860).*

55	*A. wagenerianum* K. Koch & Bouché	
56	*A. recusatum* Schott	= *A. fendleri* Schott
57	*A. fendleri* Schott	
58	*A. brachygonatum* Schott	= *A. schlechtendalii* Kunth
59	*A. spectabile* Schott	
60	*A. huegelii* Schott	= *A. hookeri* Kunth
61	*A. mexicanum* Liebm.	= *A. schlechtendalii* Kunth
62	*A. rugosum* Schott	= *A. crassinervium* (Jacq.) Schott
63	*A. crassinervium* Schott	= *A. crassinervium* (Jacq.) Schott
64	*A. hookeri* Kunth	Not sect. *Pachyneurium*
65	*A. affine* Schott	
66	*A. ellipticum* K. Koch	= *A. crassinervium* (Jacq.) Schott
67	*A. tetragonum* Hook.	= *A. schlechtendalii* Kunth
68	*A. egregium* Schott	= *A. crassinervium* (Jacq.) Schott
69	*A. schlechtendalii* Kunth	
70	*A. acaule* Schott	= *A. acaule* (Jacq.) Schott
71	*A. dombeyanum* Brongn. ex Schott	= *A. dombeyanum* Brongn. ex Schott
72	*A. agnatum* Schott	Nomen dubium
73	*A. solitarium* Schott	
74	*A. aduncum* Schott	= *A. aduncum* (Vell. Conc.) Schott section *Urospadix*?

* The numbers are those used by Schott.

APPENDIX 2. Taxonomic status of species included in Engler's sect. *Pachyneurium* (1905).*

7	*A. pendulifolium* N. E. Br.	
8	*A. paraguayense* Engl.	
9	*A. preussii* Engl.	= *A. crasinervium* (Jacq.) Schott
10	*A. joseanum* Engl.	= *A. protensum* Schott
11	*A. wagenerianum* K. Koch & Bouché	
12	*A. ellipticum* K. Koch & Bouché	= *A. crassinervium* (Jacq.) Schott
13	*A. acaule* sensu Schott (1860) & Engl. (1905) non (Jacq.) Schott	= *A. crenatum* Kunth
14	*A. recusatum* Schott	= *A. fendleri* Schott
15	*A. hookeri* Kunth	not sect. *Pachyneurium*
16	*A. jenmanii* Engl.	
17	*A. trinitatis* Engl.	= *A. jenmanii* Engl.
18	*A. tenuispadix* Engl.	= *A. uleanum* Engl.
19	*A. brachygonatum* Schott	= *A. schlechtendalii* Kunth
20	*A. buenaventurae* Engl.	= *A. fendleri* Schott
21	*A. uleanum* Engl.	
22	*A. tarapotense* Engl.	
23	*A. cubense* Engl.	
24	*A. glaziovii* Hook.f.	= *A. solitarium* (Vell. Conc.) Schott
25	*A. hacumense* Engl.	sect. *Porphyrochitonium*
26	*A. strictum* N. E. Br.	= *A. oxycarpum* Poeppig
27	*A. tetragonum* Hook. ex Schott	= *A. schlechtendalii* Kunth
28	*A. schlechtendalii* Kunth	
29	*A. crassinervium* (Jacq.) Schott	
30	*A. maximum* (Desf.) Engl.	Nomen dubium (See Excluded Species)
31	*A. leonianum* Sodiro	
32	*A. acutifolium* Engl.	
33	*A. rugosum* Schott	= *A. crassinervium* (Jacq.) Schott
34	*A. affine* Schott	
34a	*A. latissimum* Engl.	
35	*A. cymatophyllum* K. Koch & Sellow	Nomen dubium (See Excluded Species)
36	*A. barclayanum* Engl.	
37	*A. ernestii* Engl.	
38	*A. agnatum* Schott	Nomen dubium (See Excluded Species)
39	*A. kunthianum* Liebm.	= *A. schlechtendalii* Kunth
40	*A. nobile* Engl.	= *A. solitarium* (Vell. Conc.) Schott
41	*A. dombeyanum* Brongn.	= *A. dombeyanum* Brongn. ex Schott
41a	*A. rigidissimum* Engl.	= *A. dombeyanum* Brongn.
42	*A. fortinense* Engl.	= *A. schlechtendalii* Kunth
43	*A. tricarinatum* Sodiro	Nomen dubium (See Excluded Species)
44	*A. weberbaueri* Engl.	sect. *Digitinervium*
45	*A. fendleri* Schott	
46	*A. rusticum* N. E. Br. ex Engl.	= *A. paraguayense* Engl.
47	*A. salviniae* Hemsley	
48	*A. spectabile* Schott	
49	*A. lindmanianum* Engl.	
50	*A. martianum* K. Koch & Kolb	
51	*A. selloum* K. Koch	
52	*A. longispathum* Carriere	= *A. grandifolium* (Jacq.) Kunth
53	*A. grandifolium* (Jacq.) Kunth	Not sect. *Pachyneurium*
54	*A. boucheanum* K. Koch	= *A. cartilagineum* (Desf.) Kunth
55	*A. liebmannii* Schott	= *A. umbrosum* Liebm.
56	*A. umbrosum* Liebm.	Not sect. *Pachyneurium*
57	*A. cordatum* (Willd.) G. Don	Not sect. *Pachyneurium*
58	*A. andicola* Liebm.	Not sect. *Pachyneurium*
59	*A. cartilagineum* (Desf.) Kunth	Not sect. *Pachyneurium*
60	*A. brownii* Masters	Not sect. *Pachyneurium*
61	*A. appunianum* Schott	= *A. cartilagineum* (Desf.) Kunth
62	*A. seleri* Engl.	Not sect. *Pachyneurium*

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* The numbers are those used by Engler. Those with letter subscripts were treated at the end of the revision.

APPENDIX 3. Species of *Pachyneurium* (including placement in Schott (1860) and Engler (1905) where applicable).

Croat revision	Schott	Engler
acutifolium Engl.		x
var. *acutifolium*		
var. *herrerae* Croat		
**acutissimum* Engl.		sect. *Urospadix* Engl.
affine Schott	x	x
**angustilaminatum* Engl.		sect. *Urospadix* Engl.
subsp. *angustilaminatum*		
*subsp. *cibuserpentis* Croat		
anorianum Croat		
asplundii Croat		
atropurpureum R. Schultes & Maguire		
var. *arenicola* Croat		
var. *atropurpureum*		
var. *thomasii* Croat		
barclayanum Engl.		x
basirotundum Croat		
bonplandii Bunting		
subsp. *bonplandii* Bunting		
subsp. *cuatrecasii* Croat		
subsp. *guayanum* (Bunting) Croat		
bradeanum Croat & Grayum		
brenesii Croat & R. A. Baker		
bucayanum Croat		
bushii Croat		
campii Croat		
**carchiense* Croat		
cataniapoense Croat		
caucavallense Croat		
colonicum K. Krause		
concolor K. Krause		
consobrinum Schott	grex *Oxycarpium*	sect. *Episeiostenium* Schott
coriaceum G. Don in Sweet	grex *Acamptophyllium*	sect. *Urospadix* Engl.
cotobrusii Croat & R.A. Baker		
cowanii Croat		
crassinervium (Jacq.) Schott	x	x
crenatum (L.) Kunth		as *A. acaule* (Jacq.) Schott sensu Schott
cubense Engl.		x
curtispadix Croat		
dombeyanum Brongn. ex Schott	x	x
ernestii Engl.		x
var. *ernestii*		
var. *oellgaardii* Croat		
eximium Engl.		sect. *Epsieiostenium* Schott
**fasciale* Sodiro		
fatoense K. Krause		
fendleri Schott	x	x
galactospadix Croat		
glaucospadix Croat		
guanchezii Bunting		
halmoorei Croat		
hammelii Croat		
harlingianum Croat		
**holmnielsenii* Croat		
iramirezae Bunting		
jenmanii Engl.		x

APPENDIX 3. Continued.

Croat revision	Schott	Engler
johnsoniae Croat		
knappiae Croat		
krukovii Croat		
lanjouwii Jonker & Jonker		
latissimum Engl.		x
lennartii Croat		
leonianum Sodiro		x
lindmanianum Engl.		x
linguifolium Engl.		sect. *Urospadix* Engl.
llewelynii Croat		
loretense Croat		
luteynii Croat		
machetioides Matuda		
maguirei A. Hawkes		
manabianum Croat		
manuanum Croat		
martianum K. Koch & Kolb		x
**napeaum* Engl.		sect. *Urospadix* Engl.
**narinoense* Croat		
nervatum Croat		
nizandense Matuda		
**obscurinervium* Croat		
oerstedianum Schott	x	sect. *Urospadix* Engl.
**ottonis* K. Krause		
oxycarpum Poeppig & Endl.	grex *Oxycarpium*	sect. *Oxycarpium* Schott
**oxyphyllum* Sodiro		sect. *Urospadix* Engl.
pachylaminum Croat		
**palenquense* Croat		
**pallatangense* Croat		
paraguayense Engl.		x
var. *coroicoanum* Croat		
var. *paraguayense*		
pendulifolium N. E. Br.		x
**penningtonii* Croat		
plowmanii Croat		
pranceanum Croat		
prolatum Croat & R. A. Baker		
protensum Schott	grex *Erythropodium*	sect. *Urospadix* Engl.
subsp. *arcuatum* Croat		
subsp. *protensum*		
pseudospectabile Croat		
purpureospathum Croat		
ranchoanum Engl.		sect. *Calomystrium* Schott
reflexinervium Croat		
remotigeniculatum Croat		
salvadorense Croat		
salviniae Hemsley		x
**santiagoense* Croat		
sarukhanianum Croat & Haager		
schlechtendalii Kunth	x	x
subsp. *jimenezii* (Matuda) Croat		
subsp. *schlechtendalii*		
schottianum Croat & R. A. Baker		
seibertii Croat & R. A. Baker		
selloum K. Koch		x
simpsonii Croat		

APPENDIX 3. Continued.

Croat revision	Schott	Engler
solitarium (Vell. Conc.) Schott	x	as *A. affine* Schott
solomonii Croat		
**soukupii* Croat		
sparreorum Croat		
spathiphyllum N. E. Br.		sect. *Episeiostenium*
spectabile Schott	x	x
standleyi Croat & R. A. Baker		
superbum Madison		
subsp. *brentberlinii* Croat		
subsp. *superbum*		
tarapotense Engl.		x
tenaense Croat		
uleanum Engl.		x
var. *nanayense* Croat		
var. *uleanum*		
upalaense Croat & R. A. Baker		
validifolium K. Krause		
vaupesianum Croat		
venosum Griseb.		sect. *Cardiolonchium* Schott
vinillense Bunting		
wagenerianum K. Koch & Bouché	x	x
watermaliense hort ex L. Bailey & Nash		
willifordii Croat		
wurdackii Bunting		
xanthoneurum Bunting		

* Those species marked to the left with an asterisk are members of series *Multinervia*. All others are members of series *Pachyneurium*.

An x in the column under Schott or Engler indicates that the species was included in their respective systems.

APPENDIX 4. *Pachyneurium* geographical checklist.

	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama	Colombia	Ecuador	Peru	Bolivia	Venezuela	Guyana	Surinam	Fr. Guiana	Brazil	Paraguay	Argentina	West Indies
acutifolium																				
var. *acutifolium*							O	X												
var. *herrerae*							O													
acutissimum										O										
affine																	O			
angustilaminatum																				
subsp. *angustilaminatum*										O										
subsp. *cibuserpentis*										O										
anorianum									O											
asplundii										O										
atropurpureum																				
var. *atropurpureum*									O		X						X			
var. *arenicola*									X	O	X	X					X			
var. *thomasii*												O								
barclayanum										O	X									
basirotundum											O									
bonplandii																				
subsp. *bonplandii*									X				O				X			
subsp. *cuatrecasii*									X				O							
subsp. *guayanum*													O		X					
bradeanum						X	X	O												
brenesii							O													
bucayanum										O										
bushii										O										
campii										O										
carchiense									X	O										
cataniapoense													O				X			

APPENDIX 4. Continued.

	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama	Colombia	Ecuador	Peru	Bolivia	Venezuela	Guyana	Surinam	Fr. Guiana	Brazil	Paraguay	Argentina	West Indies
caucavallense									O											
colonicum								O												
concolor								O	X											
consobrinum						O	X	X												
coriaceum																	O			
cotobrusii							X	O												
cowanii														O						
crassinervium									X				O							X
crenatum																				O
cubense			X			X	X	X	X				X							O
curtispadix										O										
dombeyanum										X	O									
ernestii																				
var. *ernestii*									X	X	O						X			
var. *oellgaardii*										O										
eximium							O													
fasciale										O										
fatoense							X	O												
fendleri								X	X				O							
galactospadix									X		X						O			
glaucospadix									O											
guanchezii													O							
halmoorei	O																			
hammelii								O												
harlingianum									X	O										
holmnielseni										O										
iramirezae													O							
jenmanii													X	O	X	X	X			X

APPENDIX 4. Continued.

	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama	Colombia	Ecuador	Peru	Bolivia	Venezuela	Guyana	Surinam	Fr. Guiana	Brazil	Paraguay	Argentina	West Indies
johnsoniae									O											
knappiae											O									
krukovii																	O			
lanjouwii															O					
latissimum											O									
lennartii										O										
leonianum										O										
lindmanianum																	O			
linguifolium										O										
llewelynii											O									
loretense									X	X	O						X			
luteynii								O												
machetioides	O																			
maguirei															O					
manabianum										O										
manuanum											O									
martianum														O						
napaeum									X	O										
narinoense									O											
nervatum								O												
nizandense	O																			
obscurinervium										O										
oerstedianum							O													
ottonis											X	O								
oxycarpum									X	X	O	X					X			
oxyphyllum										O										
pachylaminum											O									
palenquense										O										
pallatangense										O										
paraguayense																				
var. *coroicoanum*											X	O								
var. *paraguayense*												X					X	O	X	

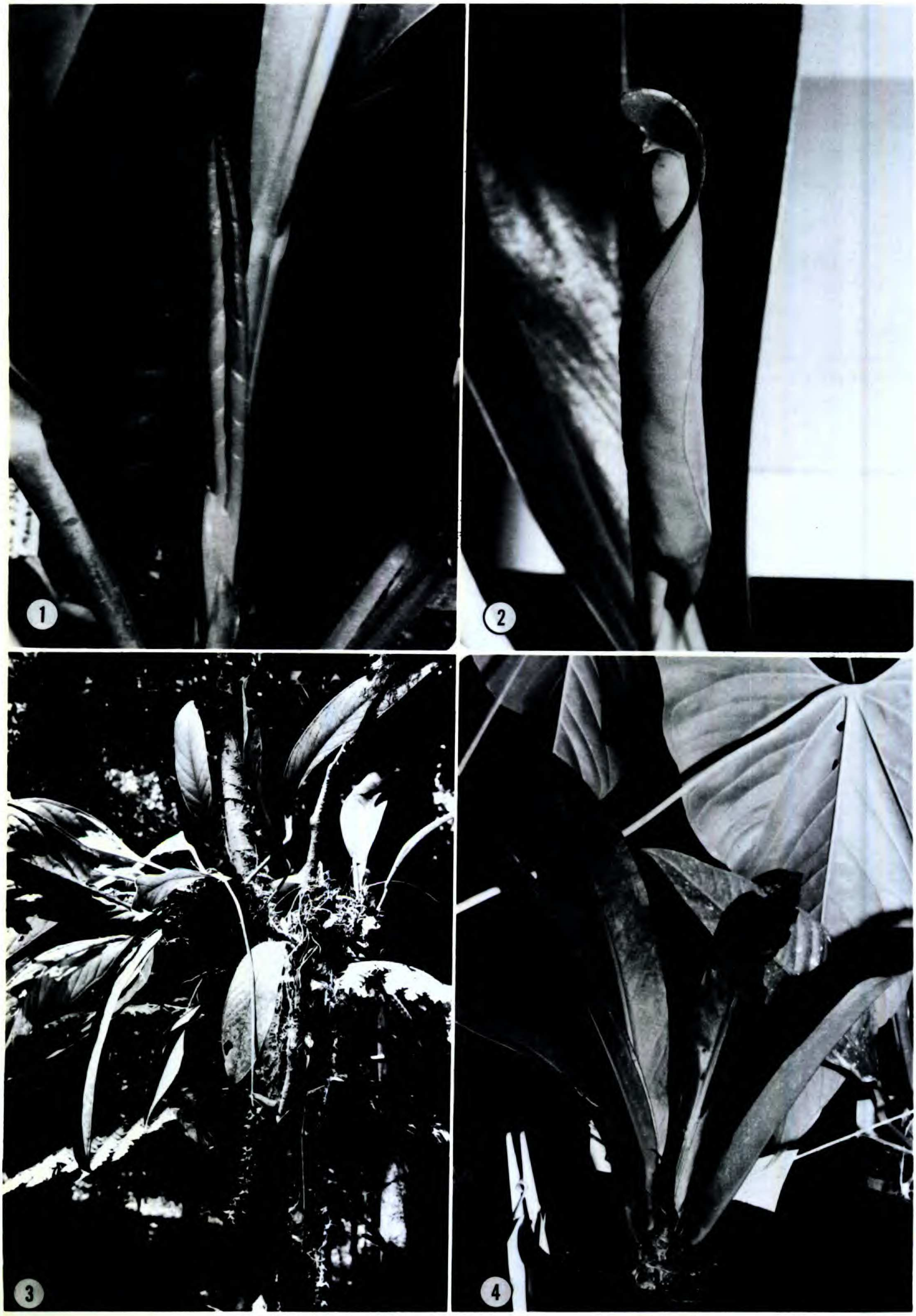
APPENDIX 4. Continued.

	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama	Colombia	Ecuador	Peru	Bolivia	Venezuela	Guyana	Surinam	Fr. Guiana	Brazil	Paraguay	Argentina	West Indies
pendulifolium									O	X	X									
penningtonii										O	X									
plowmanii											X	X					O	X		
pranceanum																	O			
prolatum							O	X												
protensum																				
subsp. *arcuatum*							X	O												
subsp. *protensum*							O	X												
pseudospectabile								O												
purpureospathum								O												
ranchoanum							O	X												
reflexinervium											O									
remotigeniculatum											O									
salvadorense			X	O																
salviniae	X		O		X	X	X	X	X											
santiagoense										O										
sarukhanianum	O																			
schlechtendalii																				
subsp. *jimenezii*	O																			
subsp. *schlechtendalii*	O	X	X		X	X														
schottianum							O													
seibertii							X	O												
selloum																				O
simpsonii											O									
solitarium																	O			
solomonii												O								
soukupii										X	O	X								
sparreorum										O										
spathiphyllum						X	X	X												
spectabile							O													
standleyi							O													

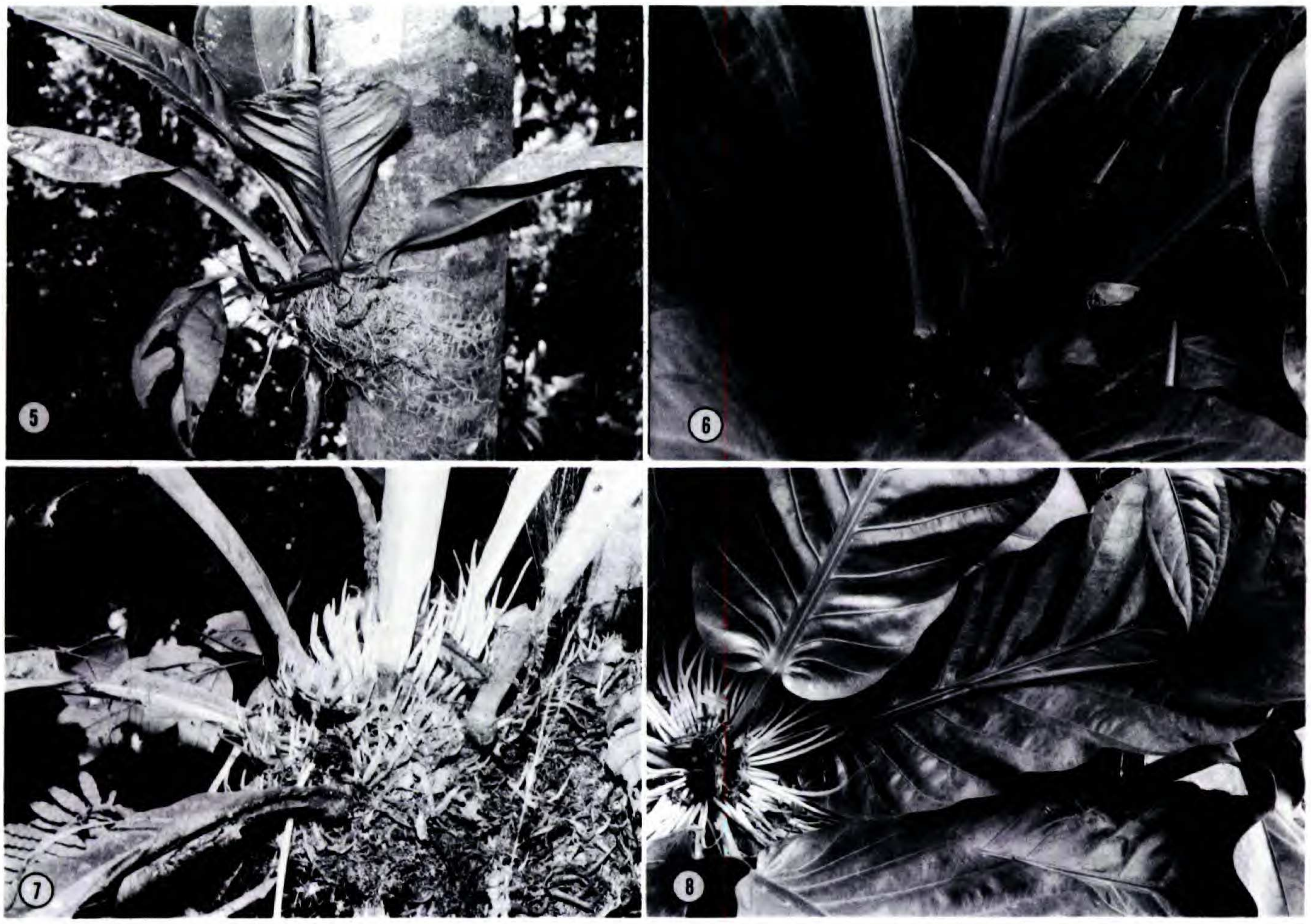
APPENDIX 4. Continued.

	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama	Colombia	Ecuador	Peru	Bolivia	Venezuela	Guyana	Surinam	Fr. Guiana	Brazil	Paraguay	Argentina	West Indies
superbum																				
subsp. *brentberlinii*											O									
subsp. *superbum*										O										
tarapotense											O									
tenaense										O										
uleanum																				
var. *nanayense*											O									
var. *uleanum*									X	X	X						O			
upalaense						X	O													
validifolium							X	O												
vaupesianum									O											
venosum																				O
vinillense													O							
wagenerianum													O							X
watermaliense							X	X												
willifordii											O									
wurdackii													O							
xanthoneurum													O							
Total # of taxa	7	1	4	1	2	7	23	23	24	36	28	9	14	3	4	1	18	2	1	7
Types	6	0	1	1	0	1	13	11	8	29	18	4	12	3	2	0	9	1	0	4
Endemics	5	0	0	0	0	0	7	5	6	23	13	2	5	2	2	0	6	0	0	3

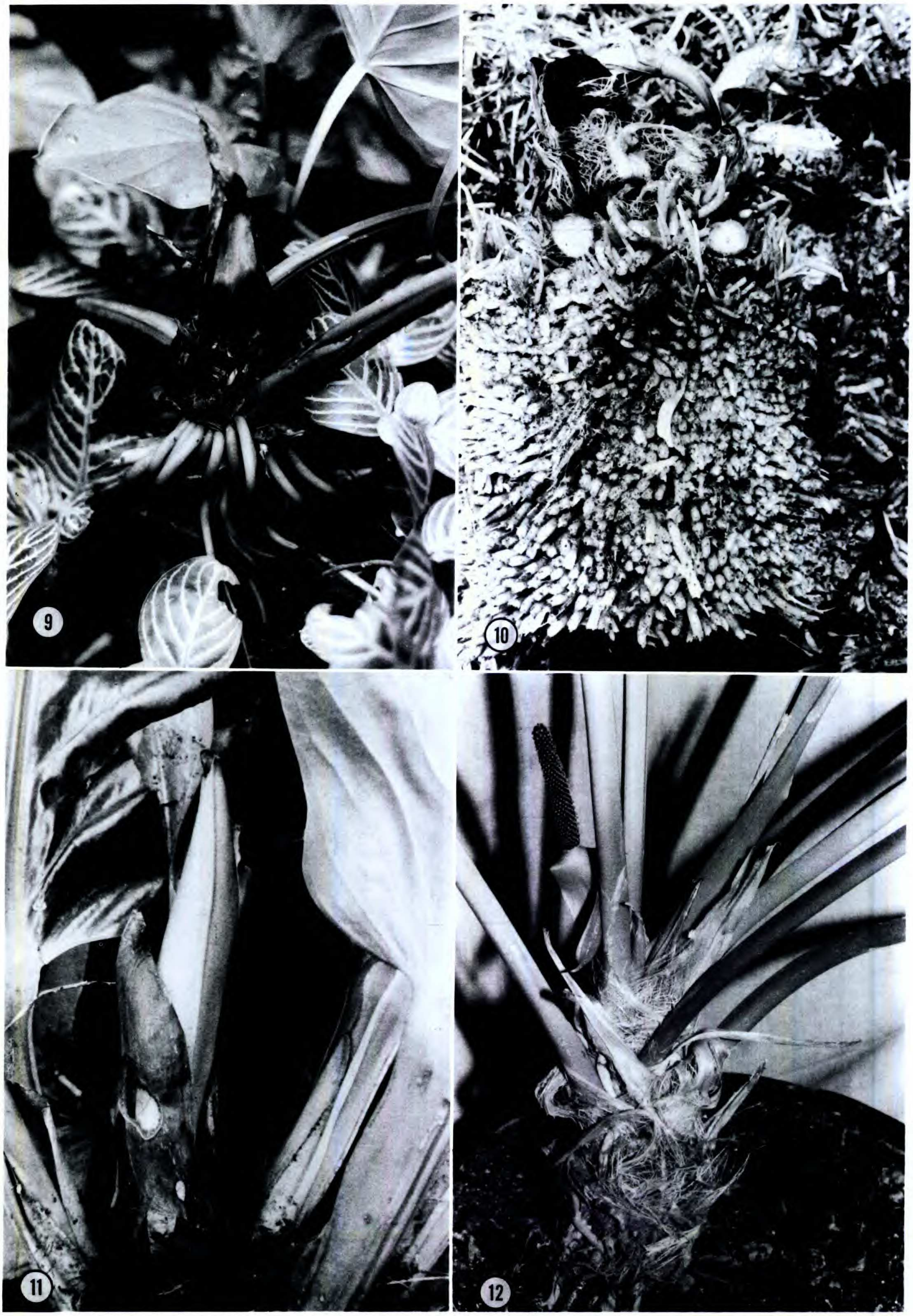
Note: circles refer to the type locality, X's refer to any other country where the species occurs.



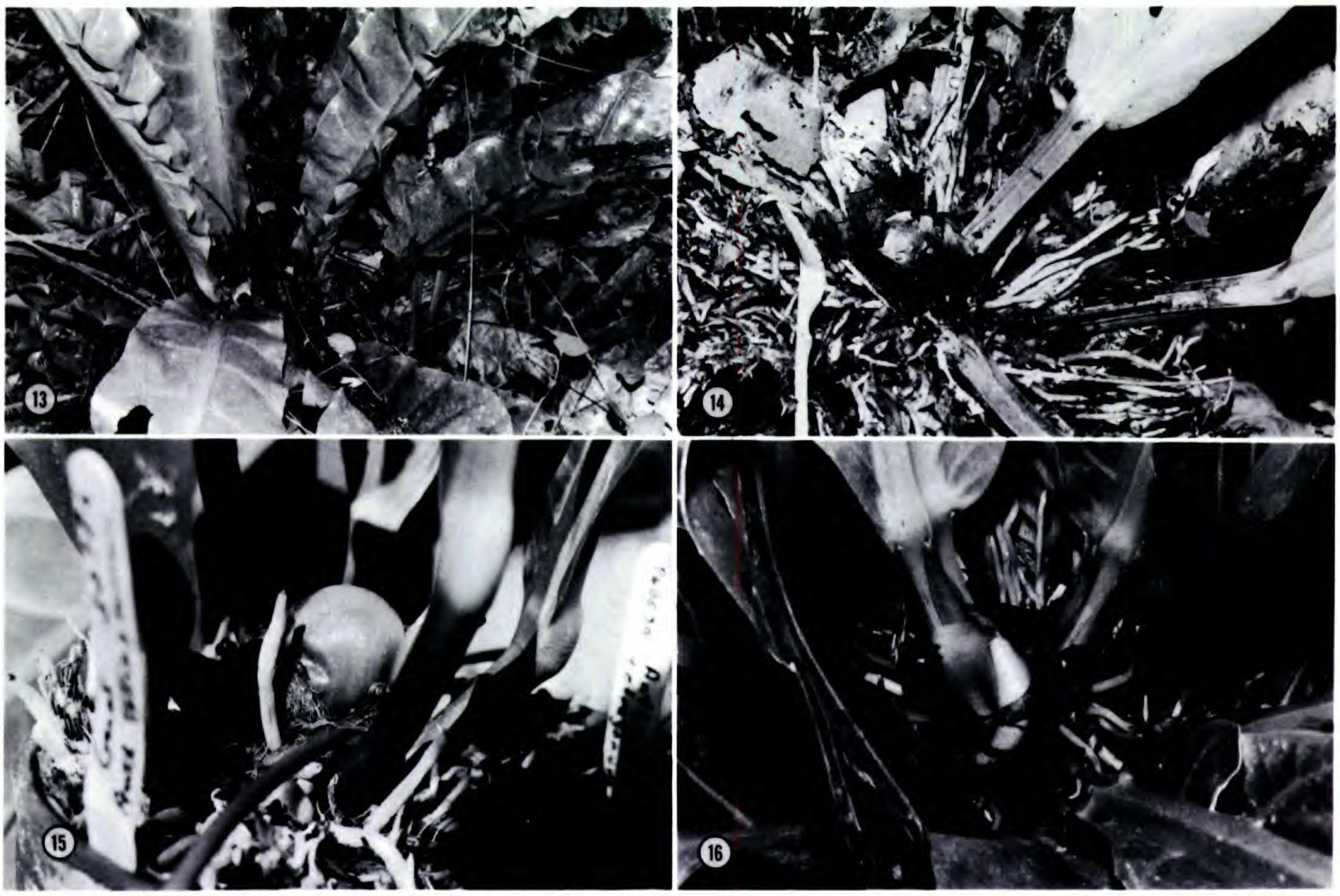
FIGURES 1–4.—1. *Anthurium cubense* Engl., *Neill 2730*, showing involute vernation.—2. *A. hacumense* Engl., showing convolute vernation.—3. *A. michelii* Guill., Panama: Fortuna, *Croat & Grayum 60252*, showing *Pachyneurium*-like habit.—4. *A. harrisii* (Graham) Endl., *Croat 38340*, showing *Pachyneurium*-like habit.



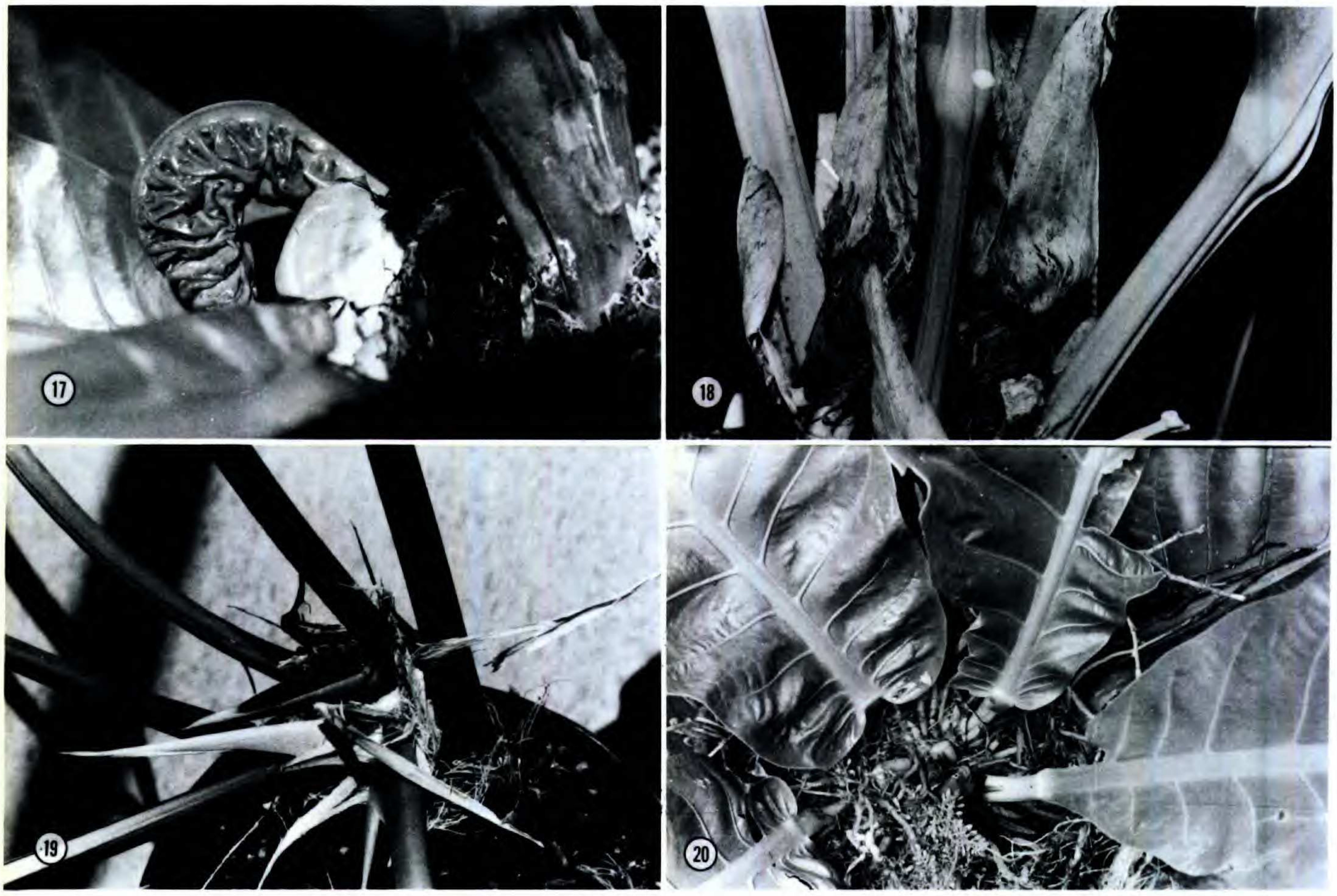
FIGURES 5–8.—5. *Anthurium hacumense* Engl., *Croat 33558*, showing *Pachyneurium*-like habit.—6. *A. hookeri* Kunth, cultivated, *Virden s.n.*, showing convolute vernation and *Pachyneurium*-like habit.—7. *Anthurium harlingianum* Croat, *Croat 50816*, showing erect, debris-trapping roots (internodes obscured by roots).—8. *A. asplundii* Croat, cultivated at Selby Bot. Gard. (*SEL 82-265*), showing new flush of roots.



FIGURES 9–12.—9. *Anthurium pendulifolium* N. E. Br., cultivated by Burle-Marx, showing semi-intact cataphyll and downward-growing roots.—10. *A. asplundii* Croat, *Croat 55586*, showing dense roots, severed petioles & hook-shaped cataphylls.—11. *A. dombeyanum* Schott, *Croat 50919* showing straight, lanceolate, intact cataphylls.—12. *A. sparreorum* Croat, *Croat 57195*, cultivated by T. Fennel, Homestead, Florida, showing weathered cataphylls.



FIGURES 13–16.—13. *Anthurium dombeyanum* Schott, *Croat 58323*, showing debris-covered roots.—14. *A. barclayanum* Engl., *Croat 50712*, showing debris-trapping roots.—15. *A. salviniae* Hemsley, *Croat 32786*, showing cucullate cataphyll.—16. *A. harlingianum* Croat, cultivated at Selby Bot. Gard., *Croat 67410*, showing hook-shaped cataphyll.



FIGURES 17–20. — 17. *Anthurium loretense* Croat, *Croat 51226*, showing circinate vernation. — 18. *A. luteynii* Croat, *Croat 25521*, showing mostly intact cataphylls. — 19. *A. sparreorum* Croat, *Croat 38666*, showing intact and weathered cataphylls. — 20. *A. salviniae* Hemsley, Panama: Barro Colorado Island (not collected), showing variation in leaf blade base shape.

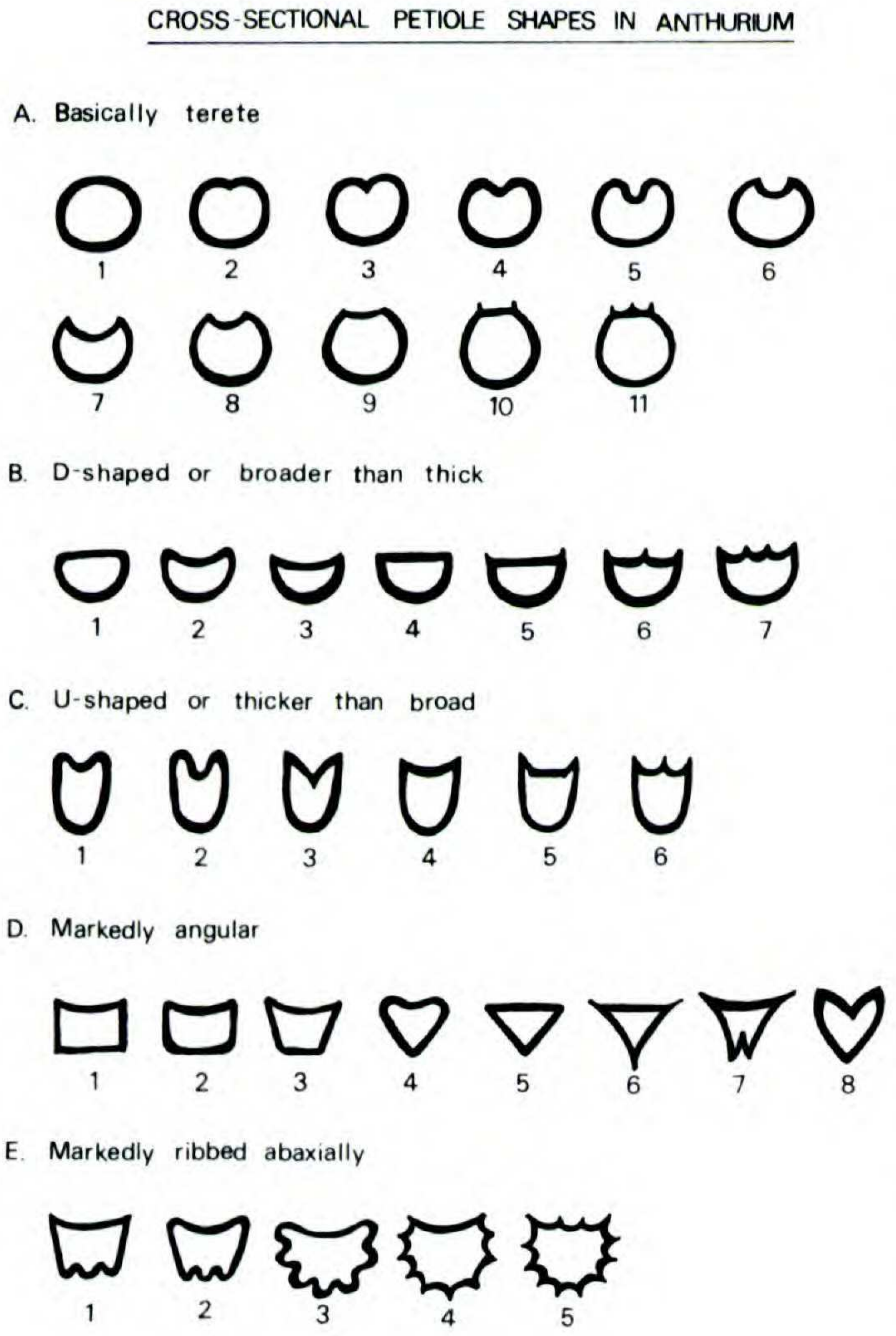

CROSS-SECTIONAL PETIOLE SHAPES IN ANTHURIUM
A. Basically terete
1
2
3
4
5
6
7
8
9
10
11
B. D-shaped or broader than thick
1
2
3
4
5
6
7
C. U-shaped or thicker than broad
1
2
3
4
5
6
D. Markedly angular
1
2
3
4
5
6
7
8
E. Markedly ribbed abaxially
1
2
3
4
5

FIGURE 21. Cross-sectional petiole shapes in *Anthurium*.—A. Basically terete: ranging from esulcate (1), to shallowly and acutely sulcate (2 & 3), to obtusely and broadly sulcate (4), to narrowly and obtusely sulcate (5), to narrowly and acutely sulcate (6), broadly and acutely sulcate (7), shallowly and broadly sulcate (8), flat adaxially (9), flat adaxially with marginal ribs (10), to flat adaxially with marginal and medial ribs (11).—B. D-shaped or broader than thick: ranging from flat adaxially with obtuse margins (1), to broadly sulcate with obtuse margins (2), broadly sulcate with acute margins (3), flat adaxially with acute margins (4), flat adaxially with erect margins (5), to flat adaxially with erect margins and with 1 or more medial ribs (6 & 7).—C. U-shaped or thicker than broad: ranging from broadly and obtusely sulcate (1) to narrowly and obtusely sulcate (2), narrowly and acutely sulcate with acute margins (3), shallowly and acutely sulcate (4), sulcate with acute margins (5), to sulcate with sharp margins and a medial rib (6).—D. Markedly angular: ranging from quadrangular with acute angles (1), to quadrangular with obtuse angles (2), trapezoidal (3), obtusely triangular (4), acutely triangular (5), acutely triangular with 2 marginal ribs (6), basically triangular with two abaxial ribs (7), obtusely triangular, narrowly and sharply sulcate with convex sides (8).—E. Markedly ribbed abaxially: ranging from trapezoidal or quadrangular, sharply and broadly sulcate adaxially, 3-ribbed abaxially (1), to obtusely and broadly sulcate adaxially, 3-ribbed abaxially (2), broadly and obtusely sulcate adaxially, 5-ribbed abaxially (3), broadly and sharply sulcate adaxially, narrowly and sharply ribbed around the remaining circumference (4), or with one or more ribs on the sulcus (5).

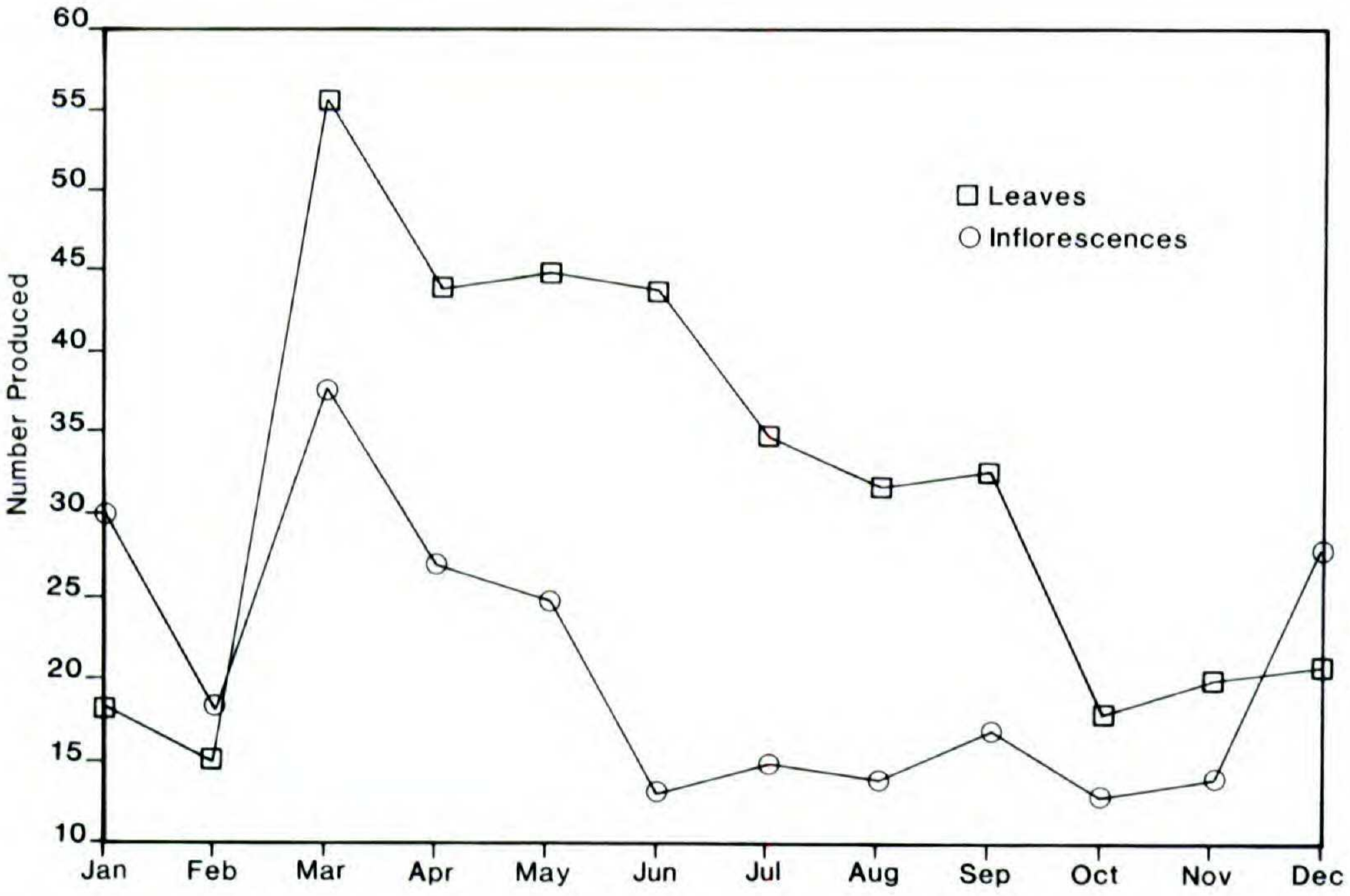
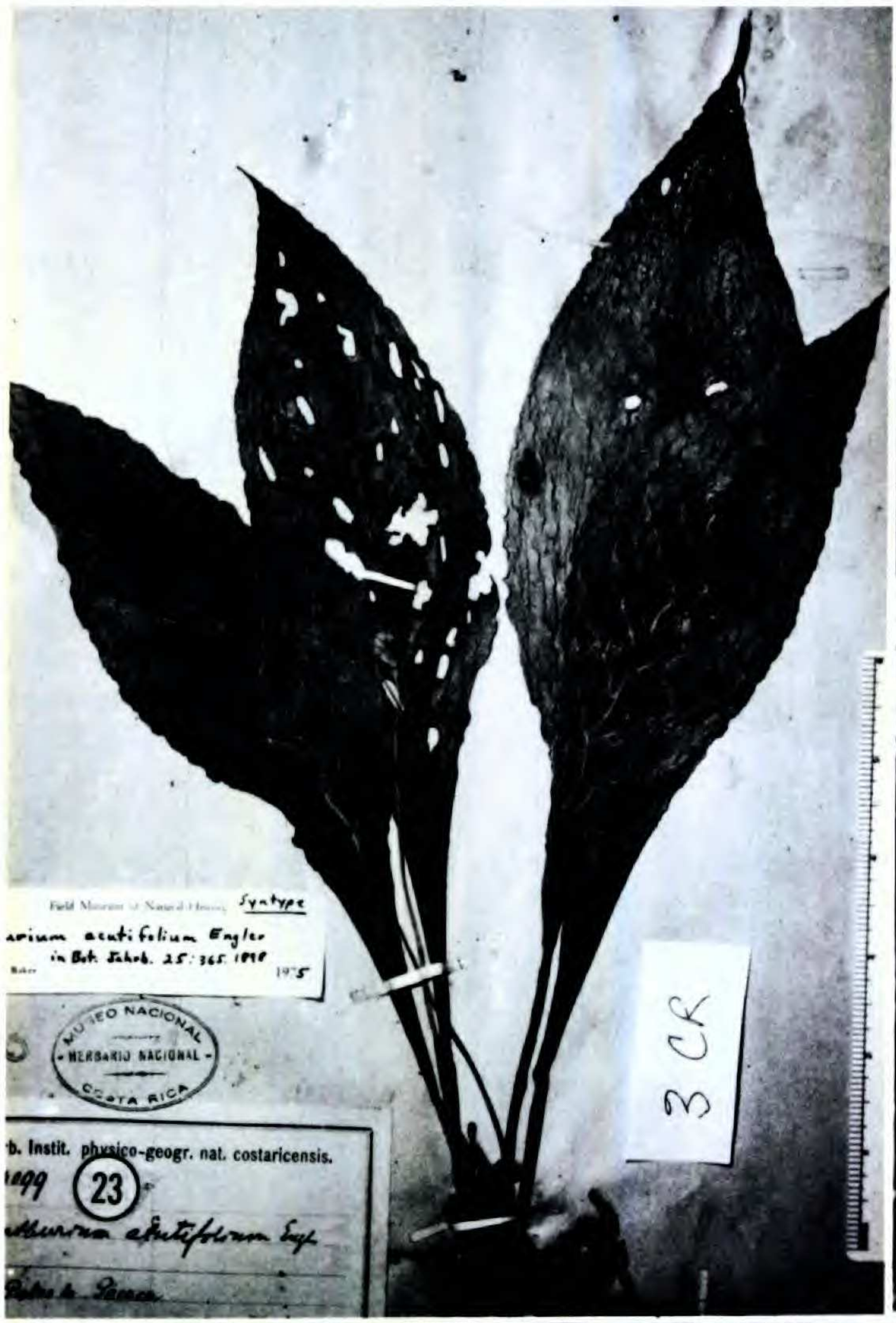


FIGURE 22. Graph illustrating inflorescence and leaf production over 2-year period.


Field Museum of Natural History Syntype
arium acutifolium Engler
in Bot. Jahrb. 25: 365. 1898
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b. Instit. physico-geogr. nat. costaricensis.
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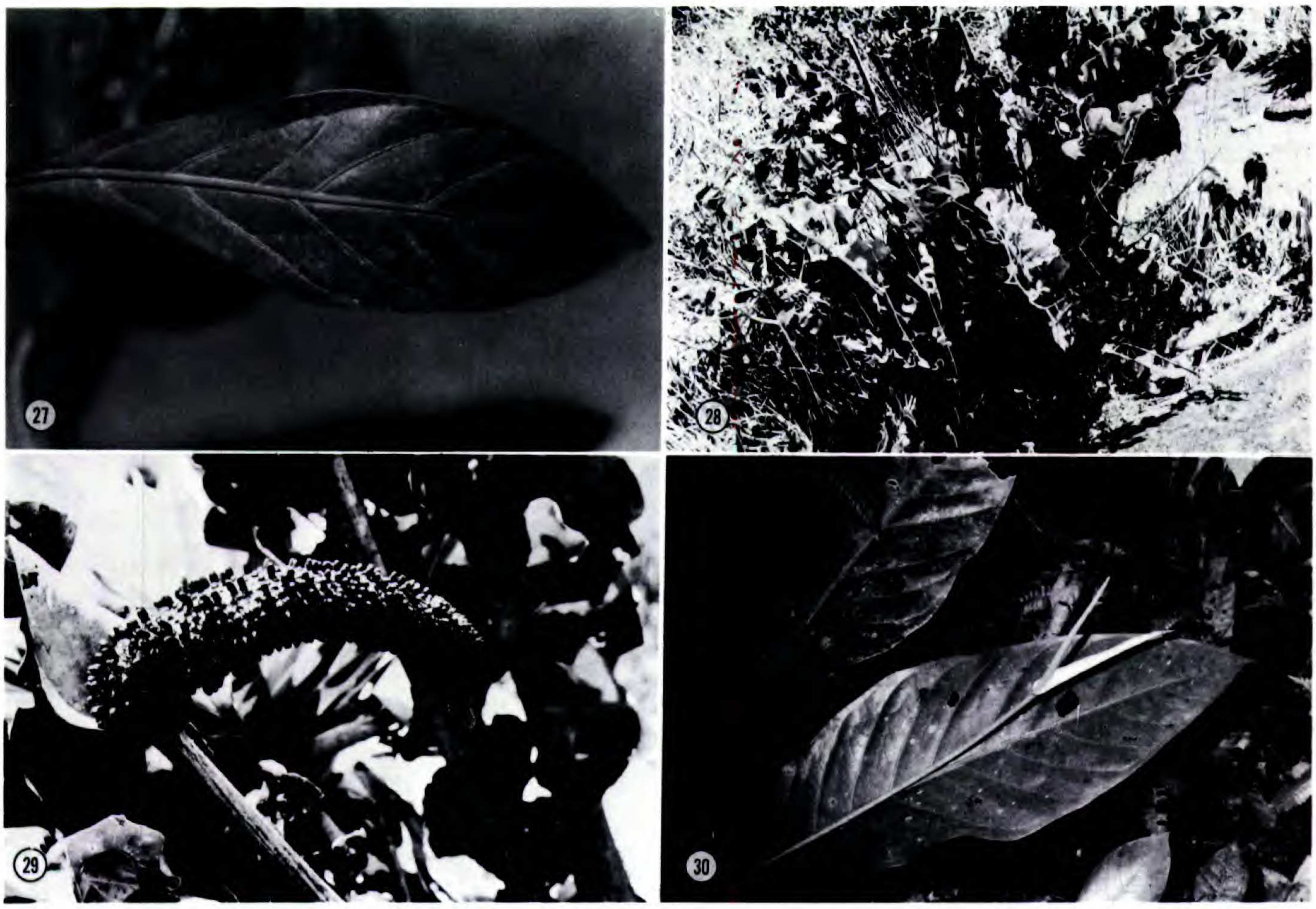
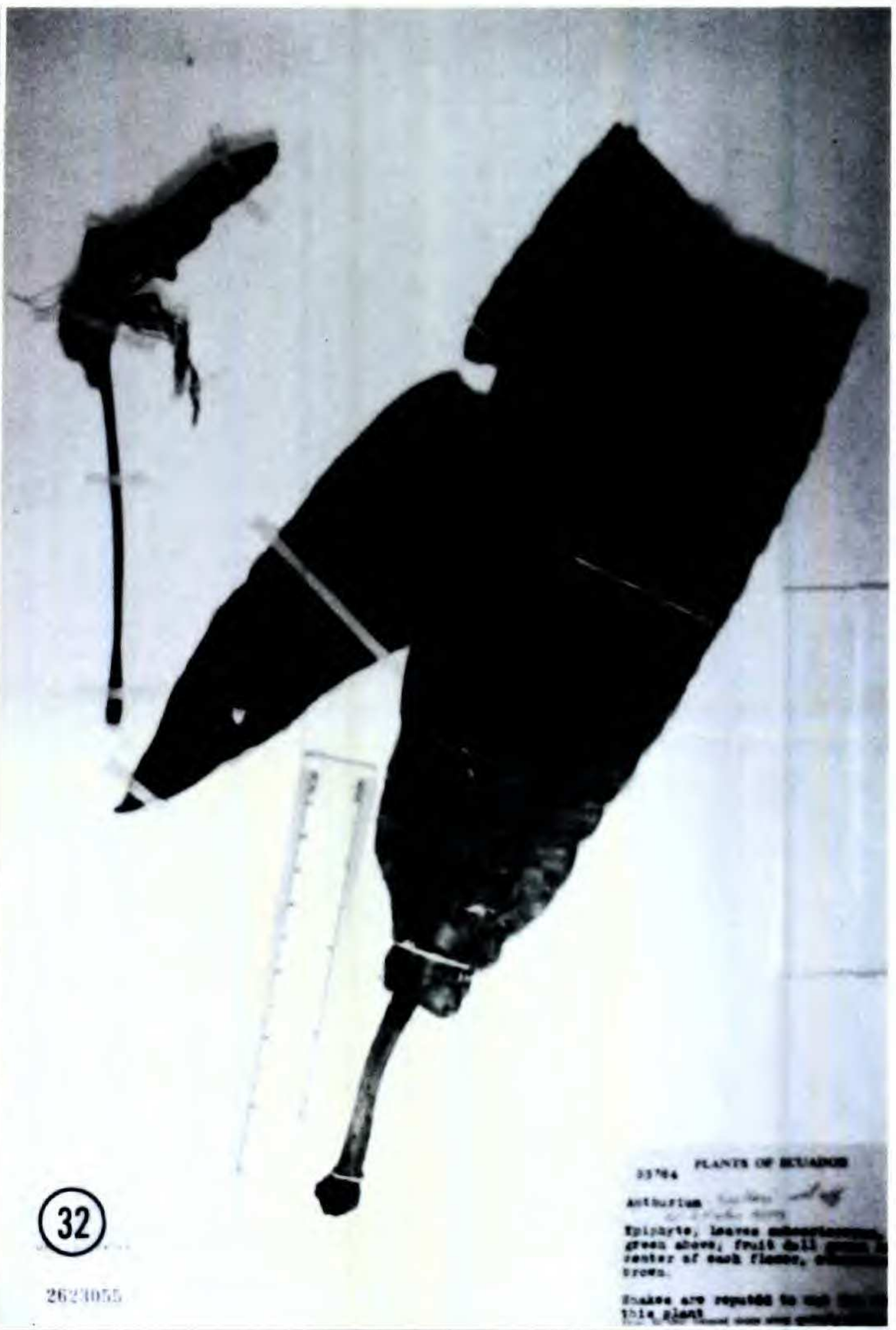
23
thurium acutifolium Engl.

FIGURES 23–26.—23. *Anthurium acutifolium* Engl., *Pittier 4099*.—24–25. *A. acutissimum* Engl., *Madison 2094*.—26. *A. affine* Schott, *Storr 194* (cultivated at Kew).



FIGURES 27–30.—27. *Anthurium acutifolium* Engl., *Croat 59853.*—28–29. *A. affine* Schott, *Hahn s.n.* (photo by B. Hahn).—30. *A. anorianum* Croat, *Croat 56757.*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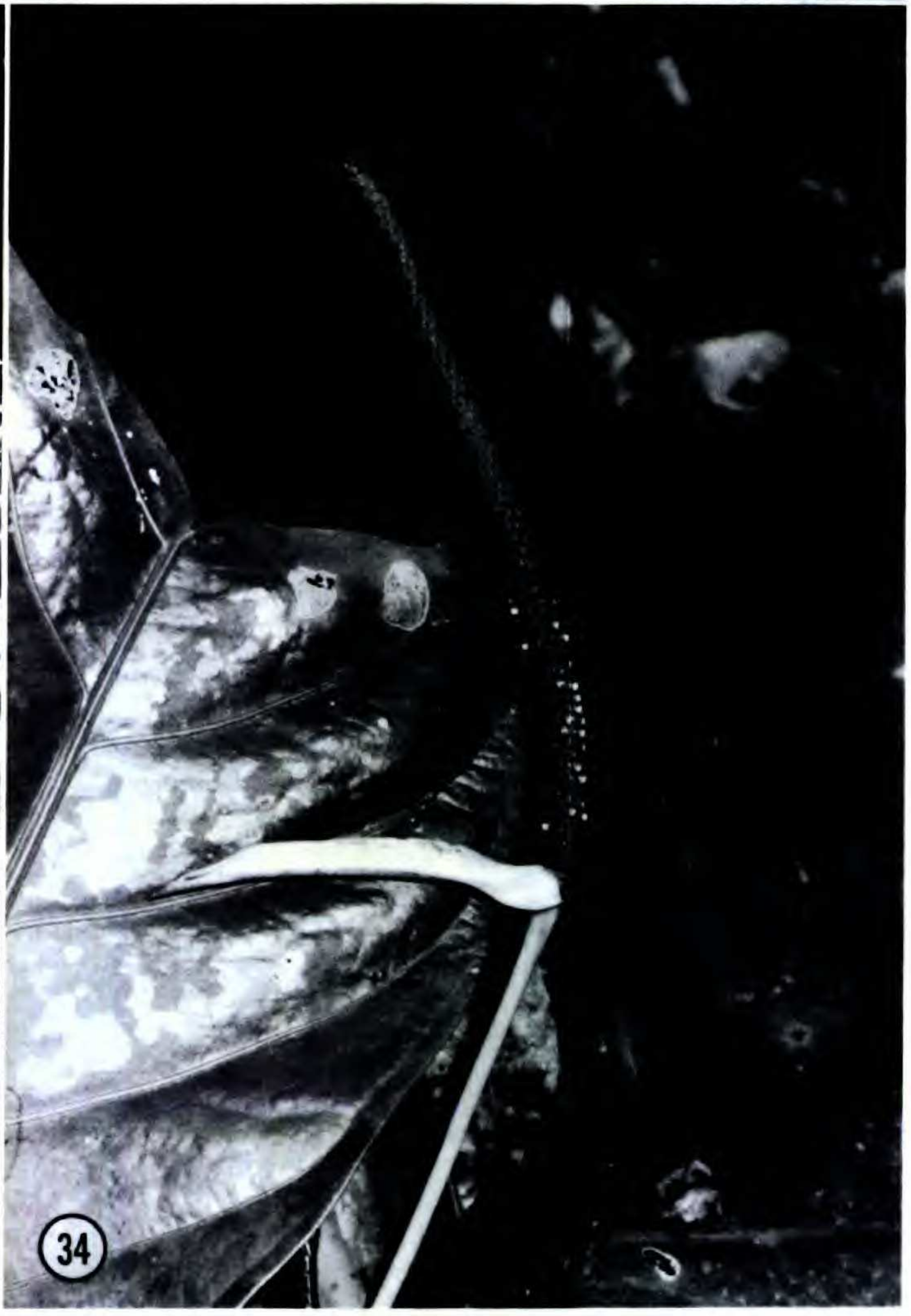
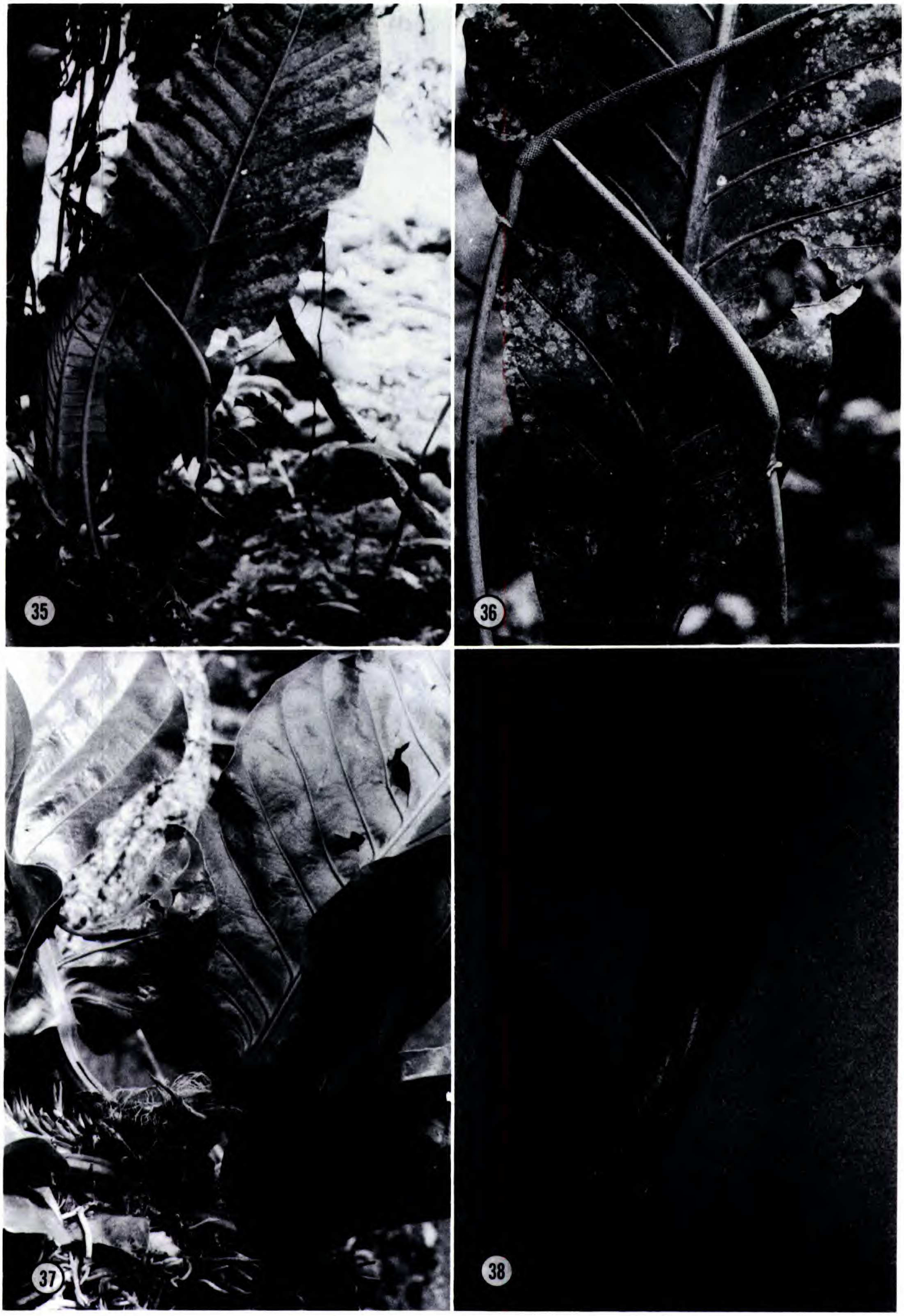
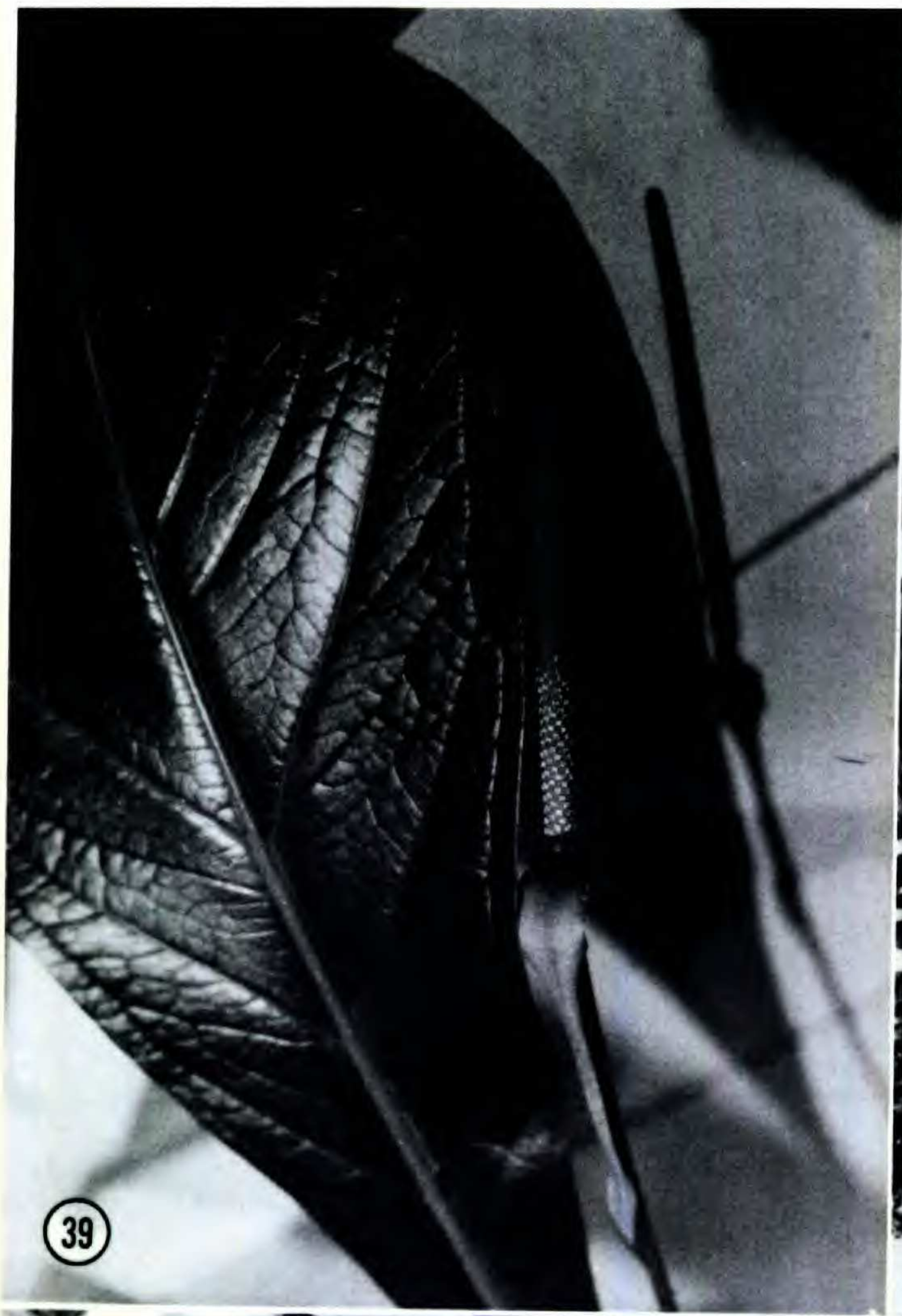
PLANTS OF ECUADOR

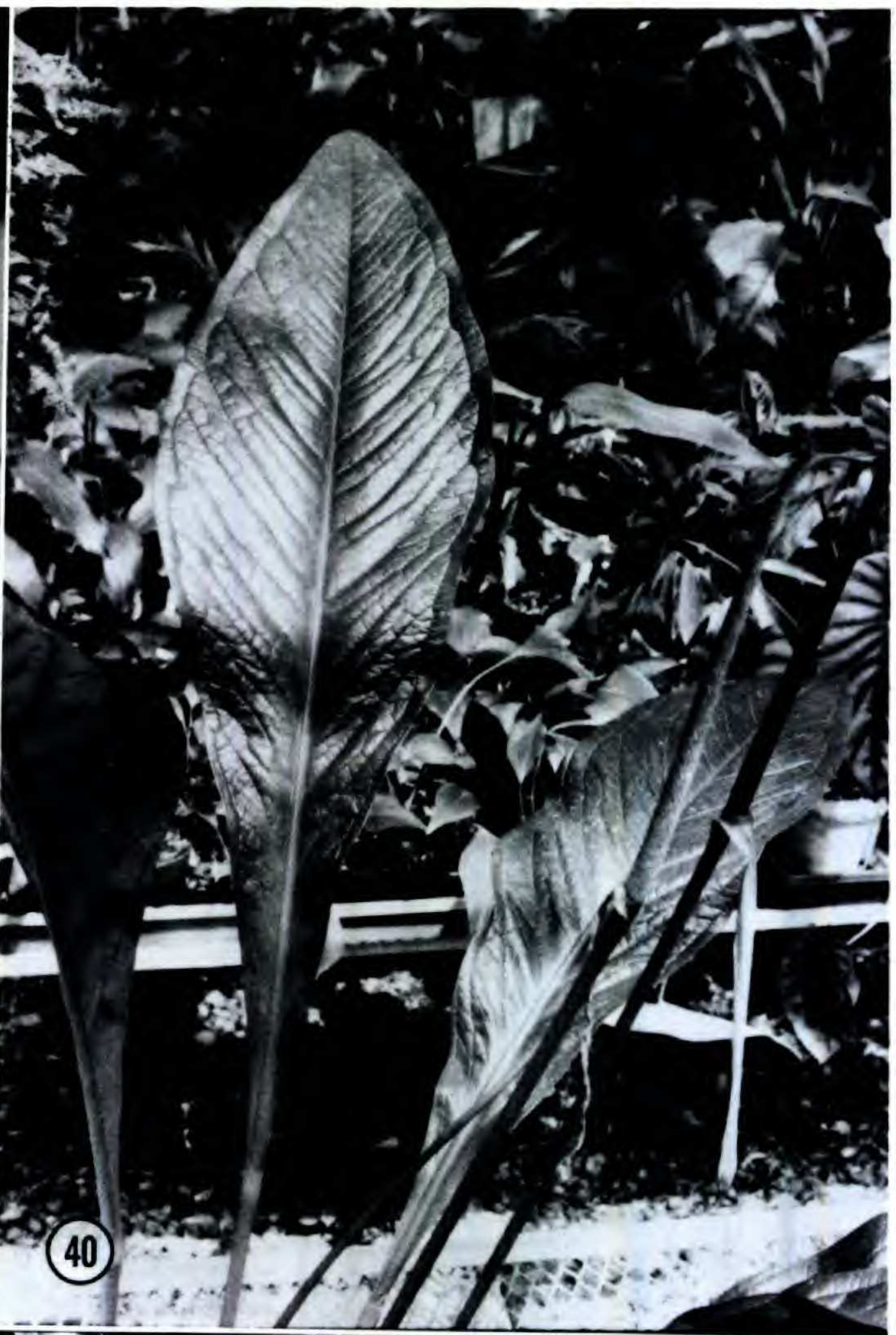


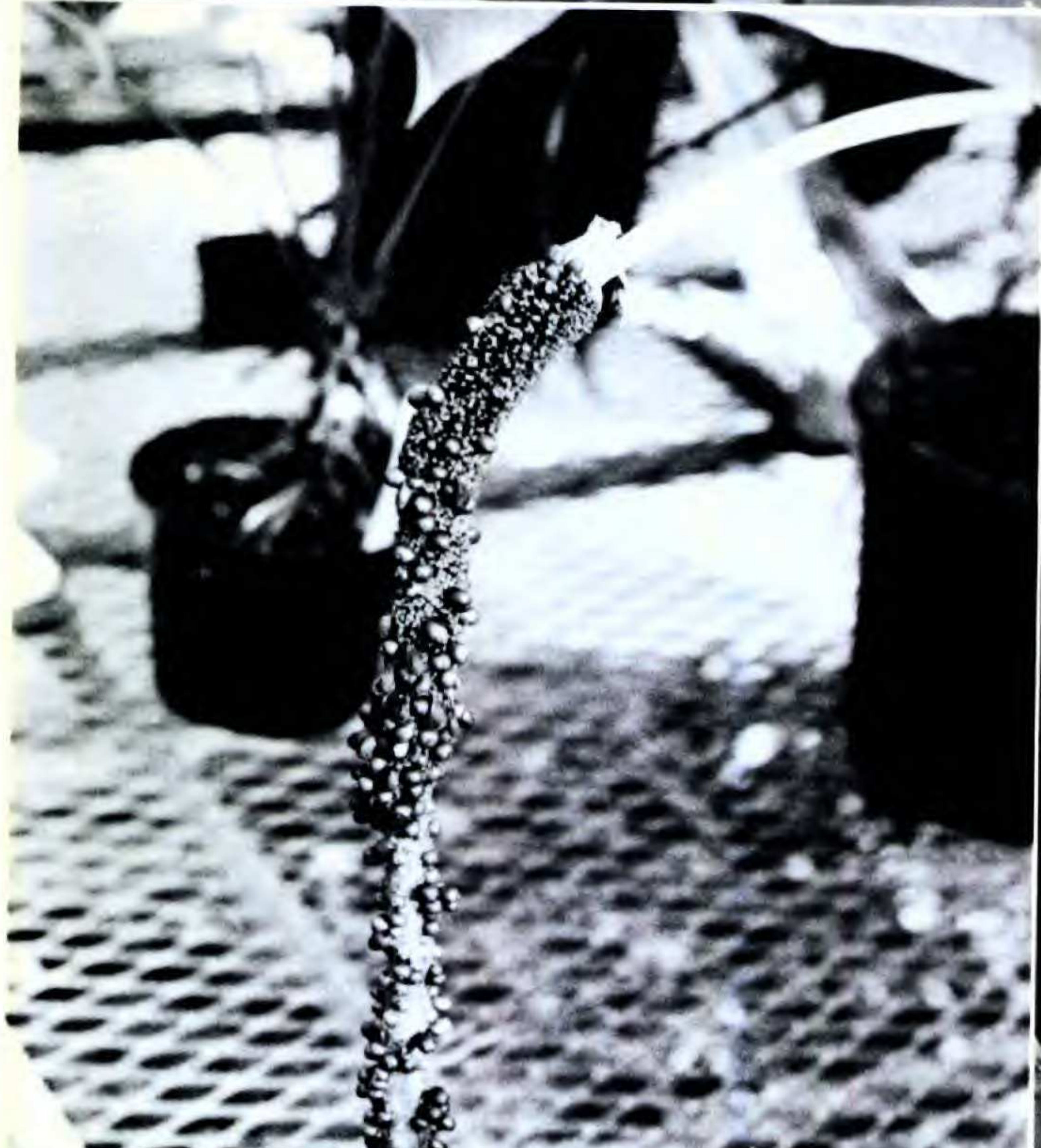
FIGURES 31–34.—31. *Anthurium angustilaminatum* Engl. subsp. *angustilaminatum*, *Sodiro s.n.*—32. *A. angustilaminatum* Engl. var. *cibuserpentis* Croat, *Steyermark 53764.*—33, 34. *A. anorianum* Croat, *Croat 56757.*

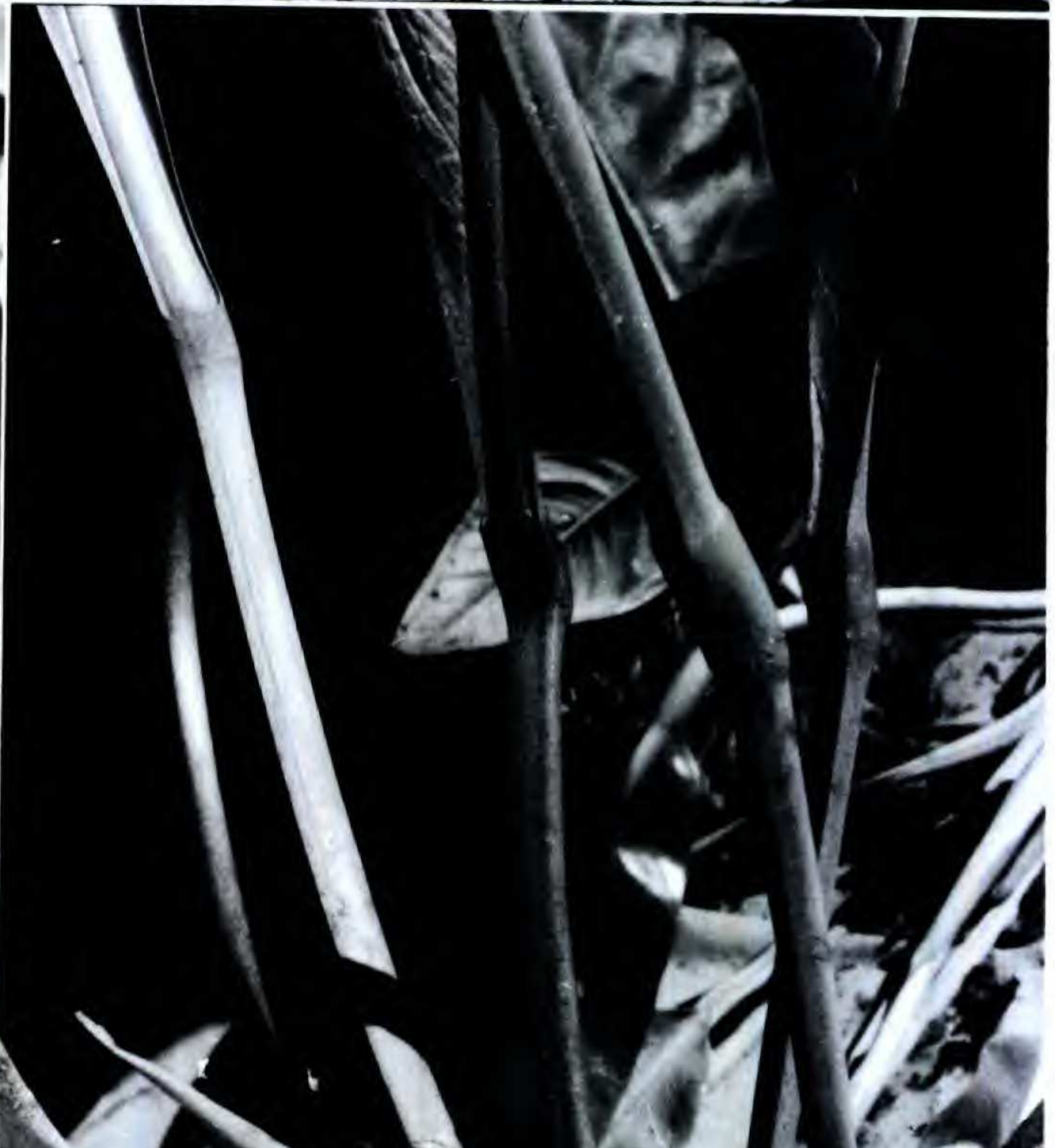


FIGURES 35–38.—35, 36. *Anthurium asplundii* Croat, *Croat 50693.*—37. *A. asplundii* Croat, *Croat 55586.*—38. *A. atropurpureum* R. Schultes & Maguire var. *atropurpureum*, *Croat 56927.*

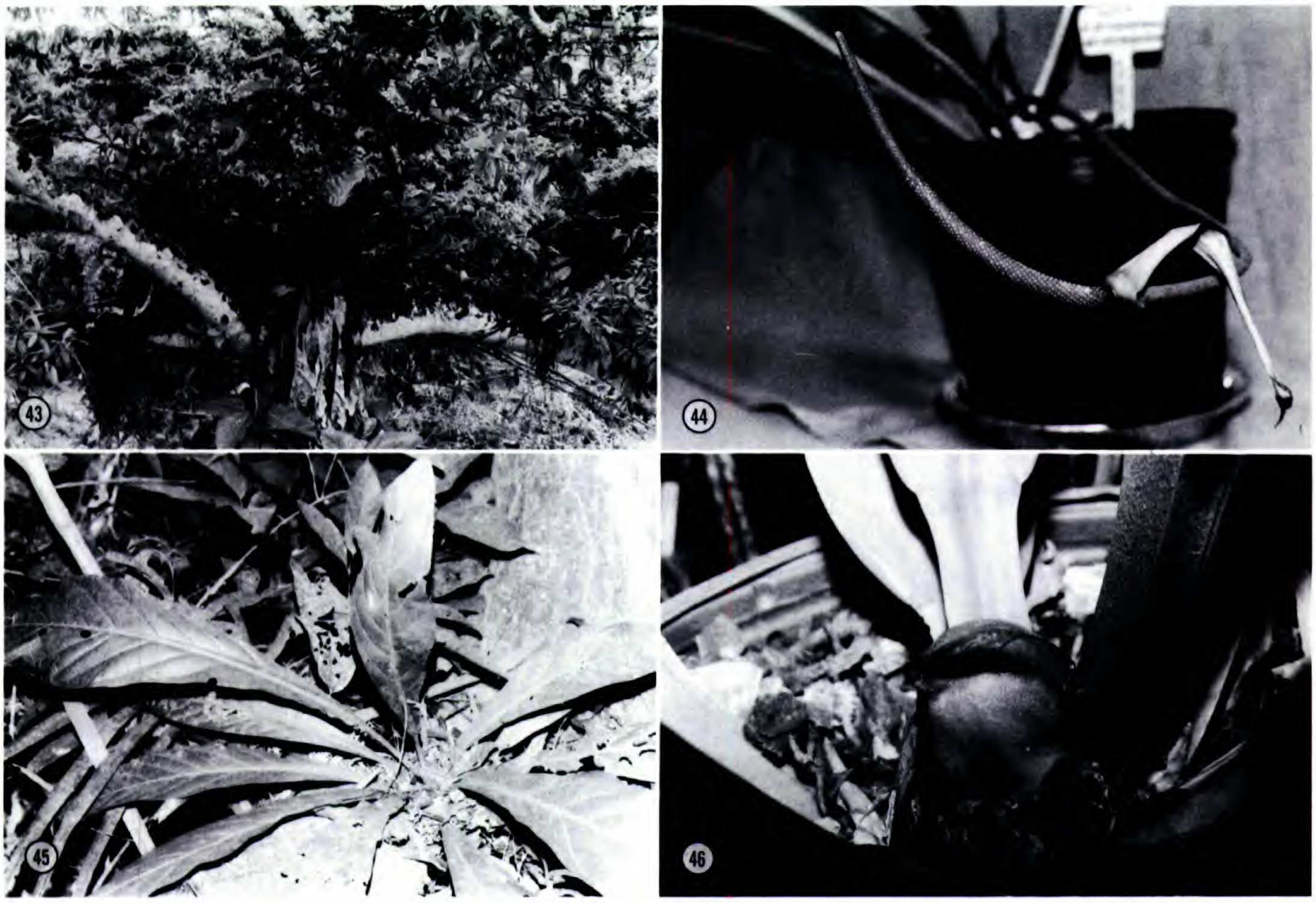




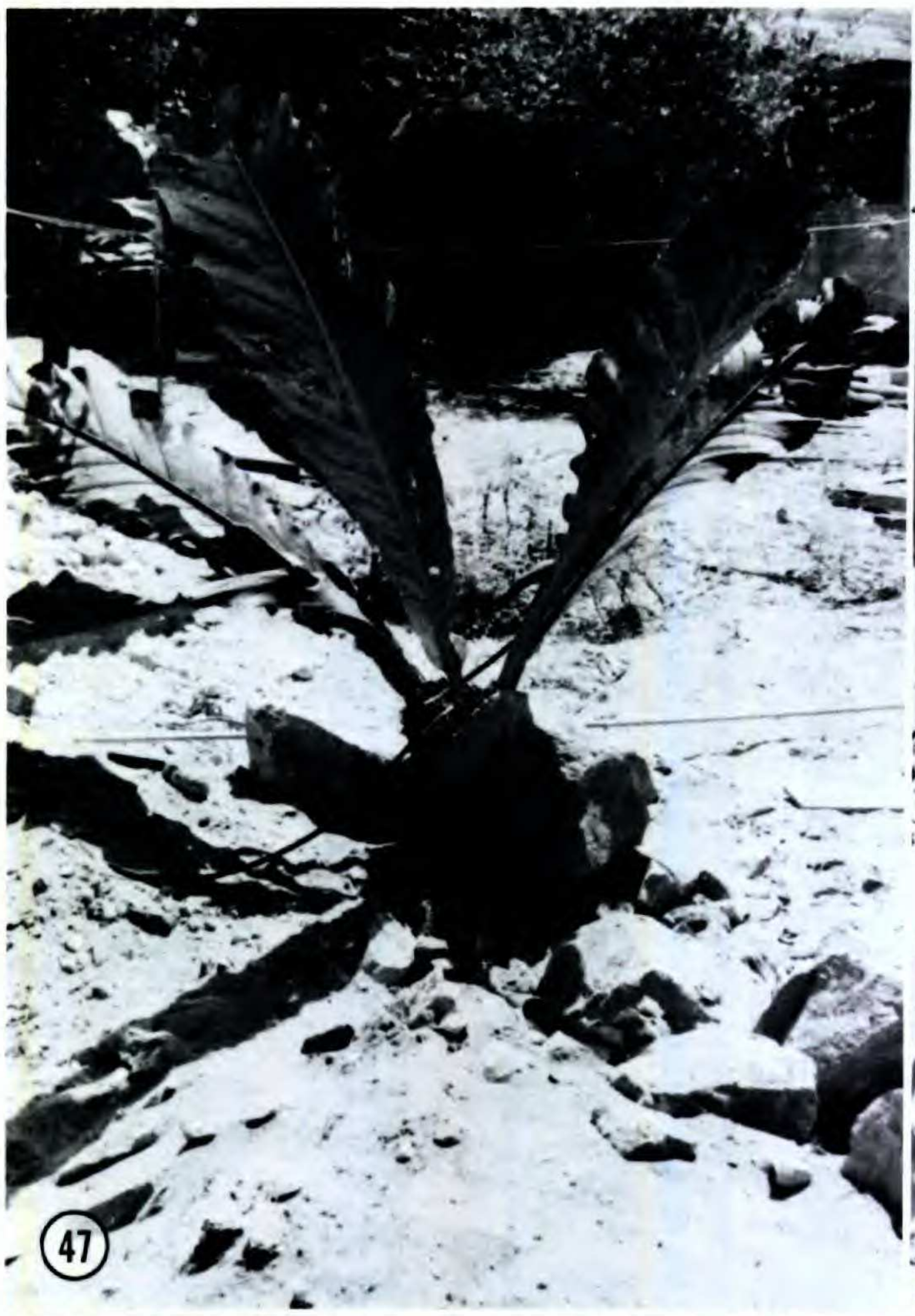


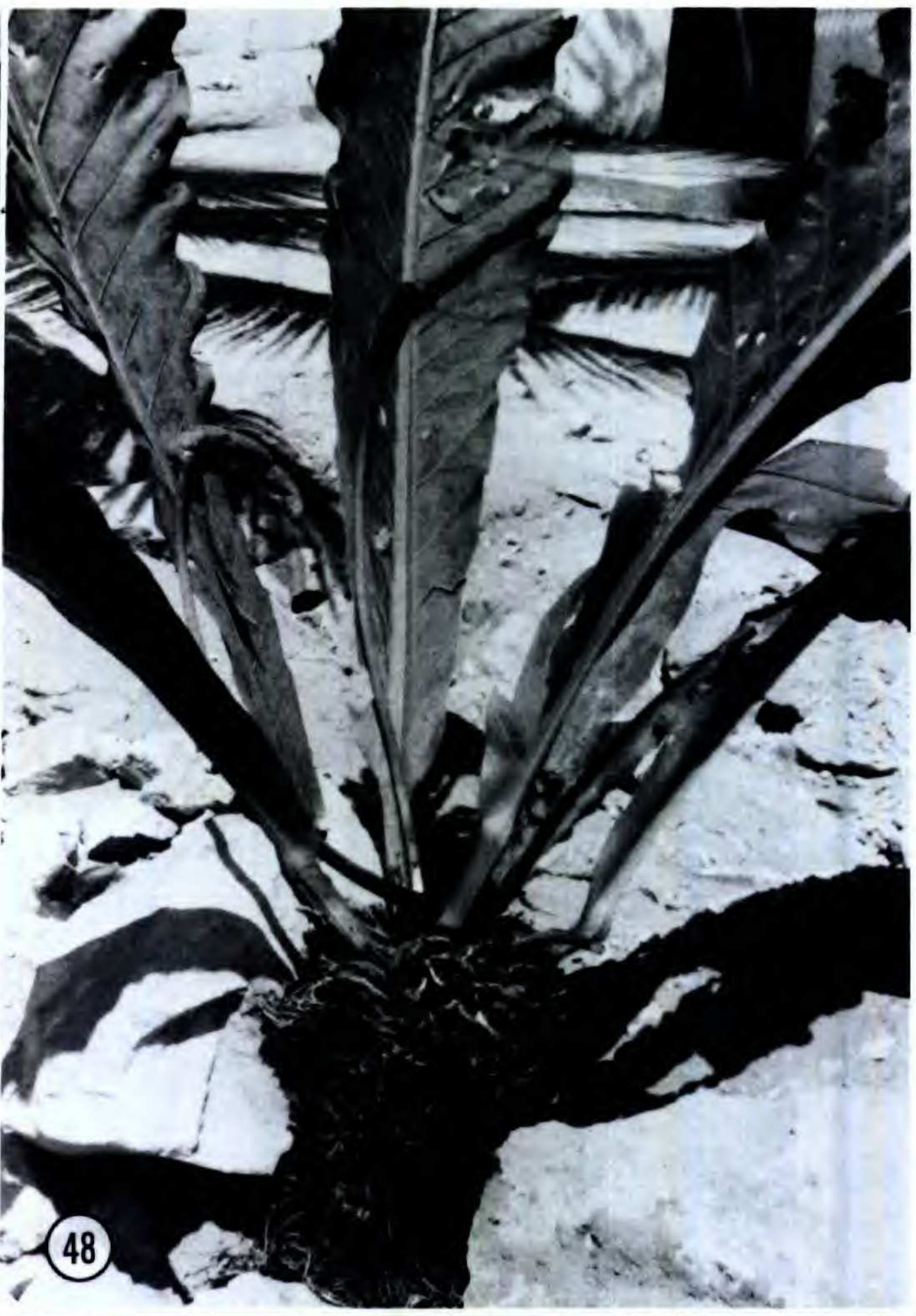


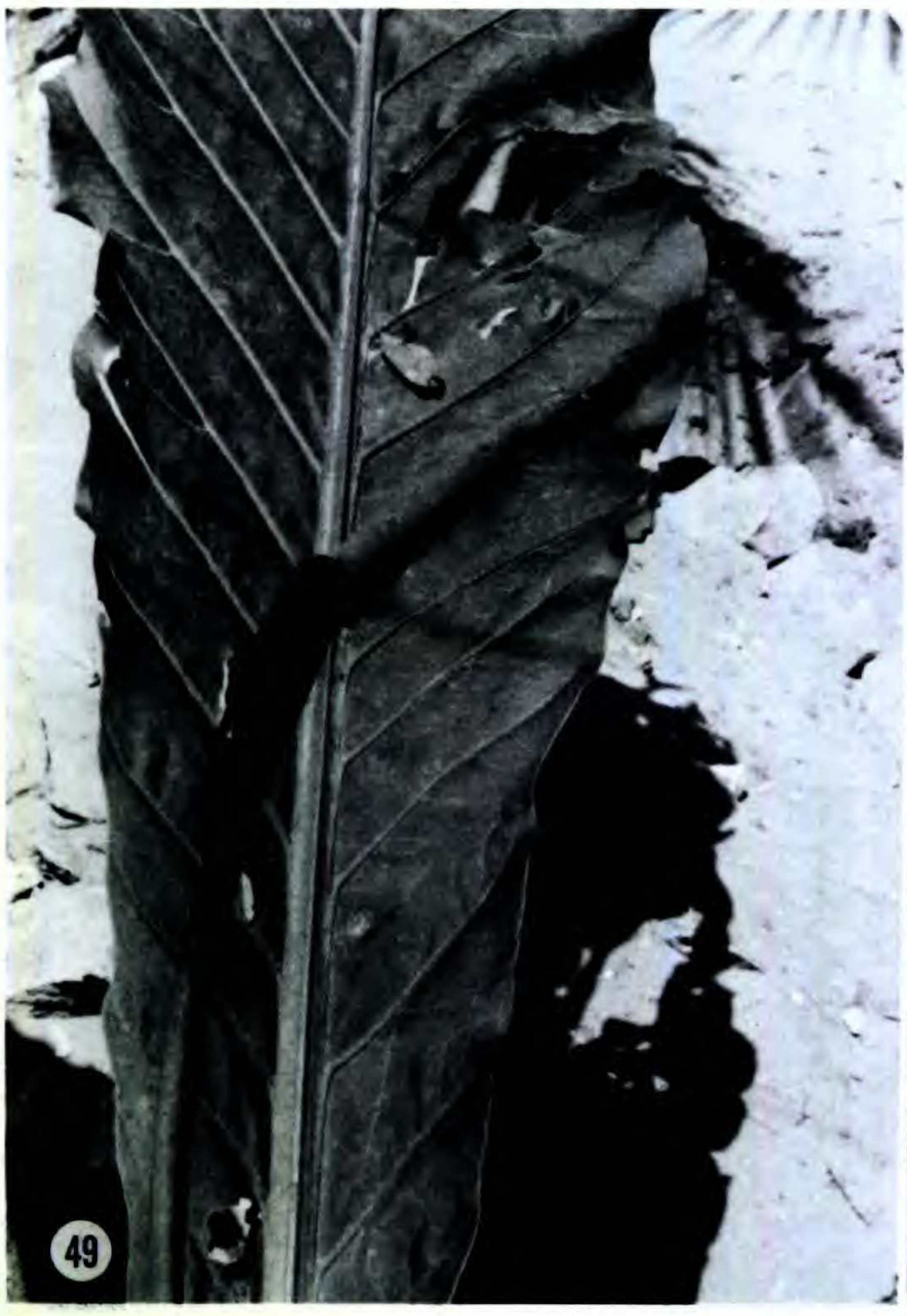
FIGURES 39–42.—39. *Anthurium atropurpureum* R. Schultes & Maguire var. *arenicola* Croat, *Croat 50303.*—40, 41. *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat, cultivated at Selby Bot. Gard. (*SEL 78-1146*).—42. *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat, *Croat 53698.*

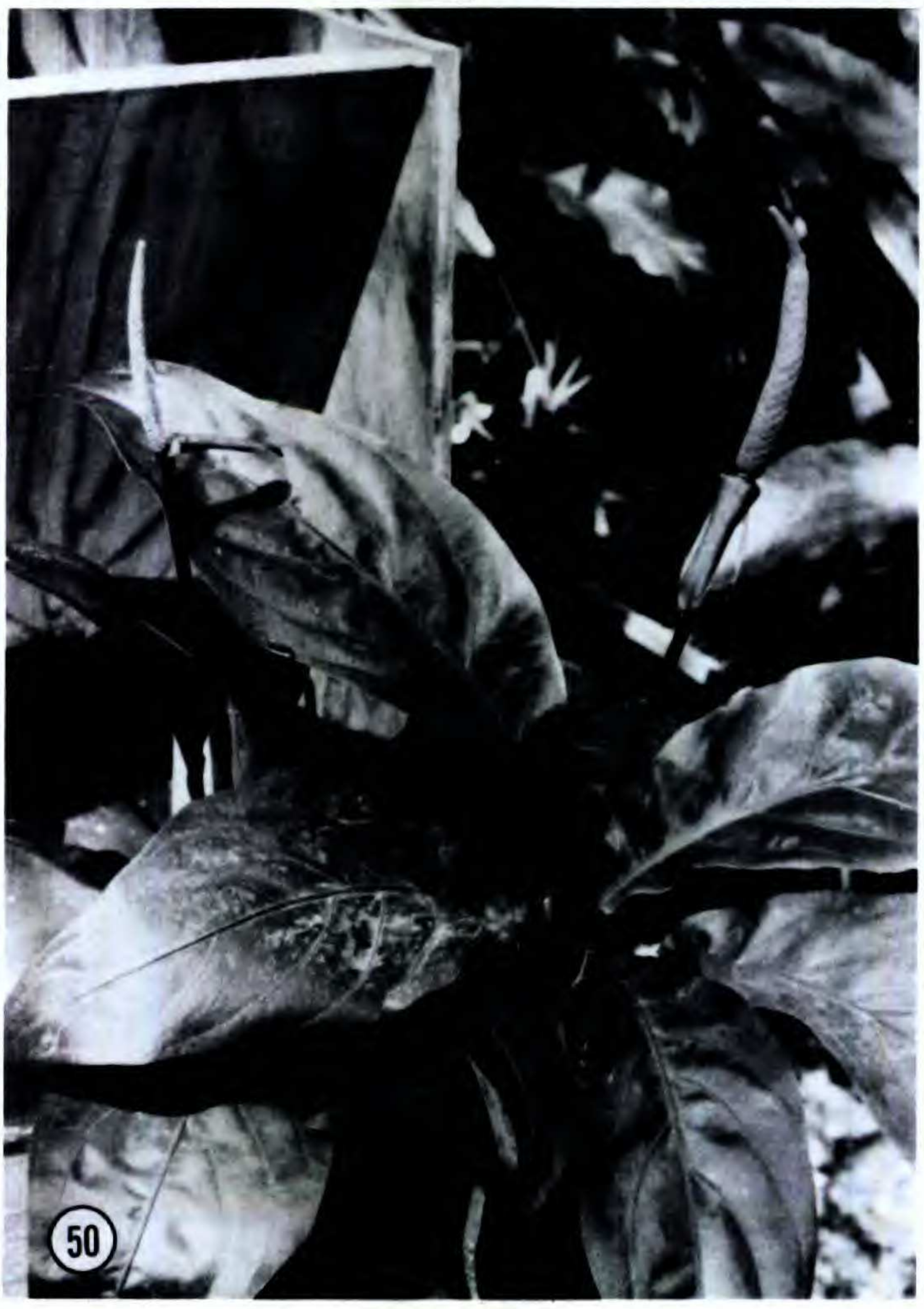


FIGURES 43–46.—43. *Anthurium asplundii* Croat, *Croat 55608*.—44. *A. atropurpureum* R. Schultes & Maguire var. *atropurpureum*, *Croat 56927*.—45. *A. atropurpureum* R. Schultes & Maguire var. *arenicola* Croat, *Croat 53582*.—46. *A. barclayanum* Engl., *Croat 50702*.

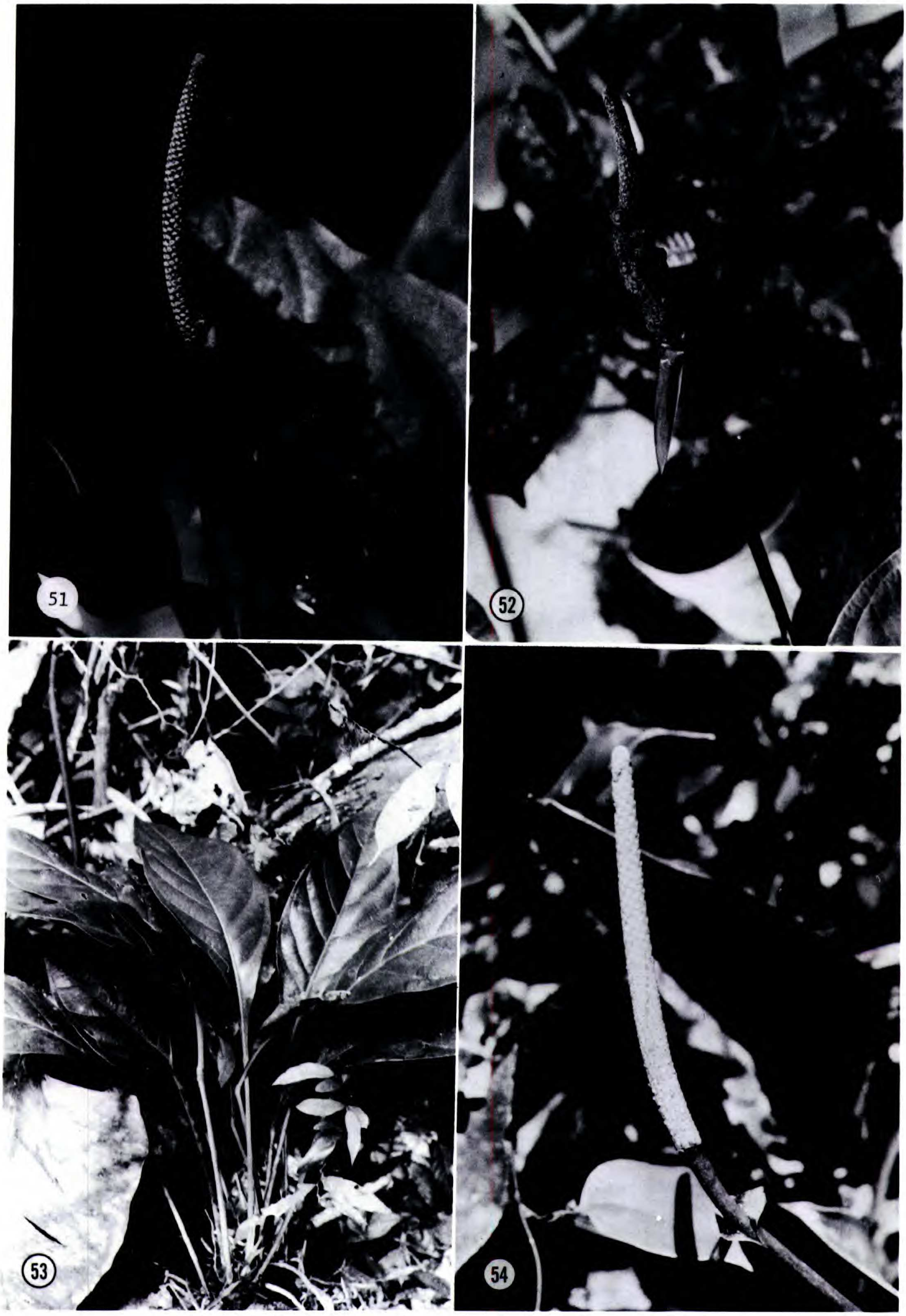




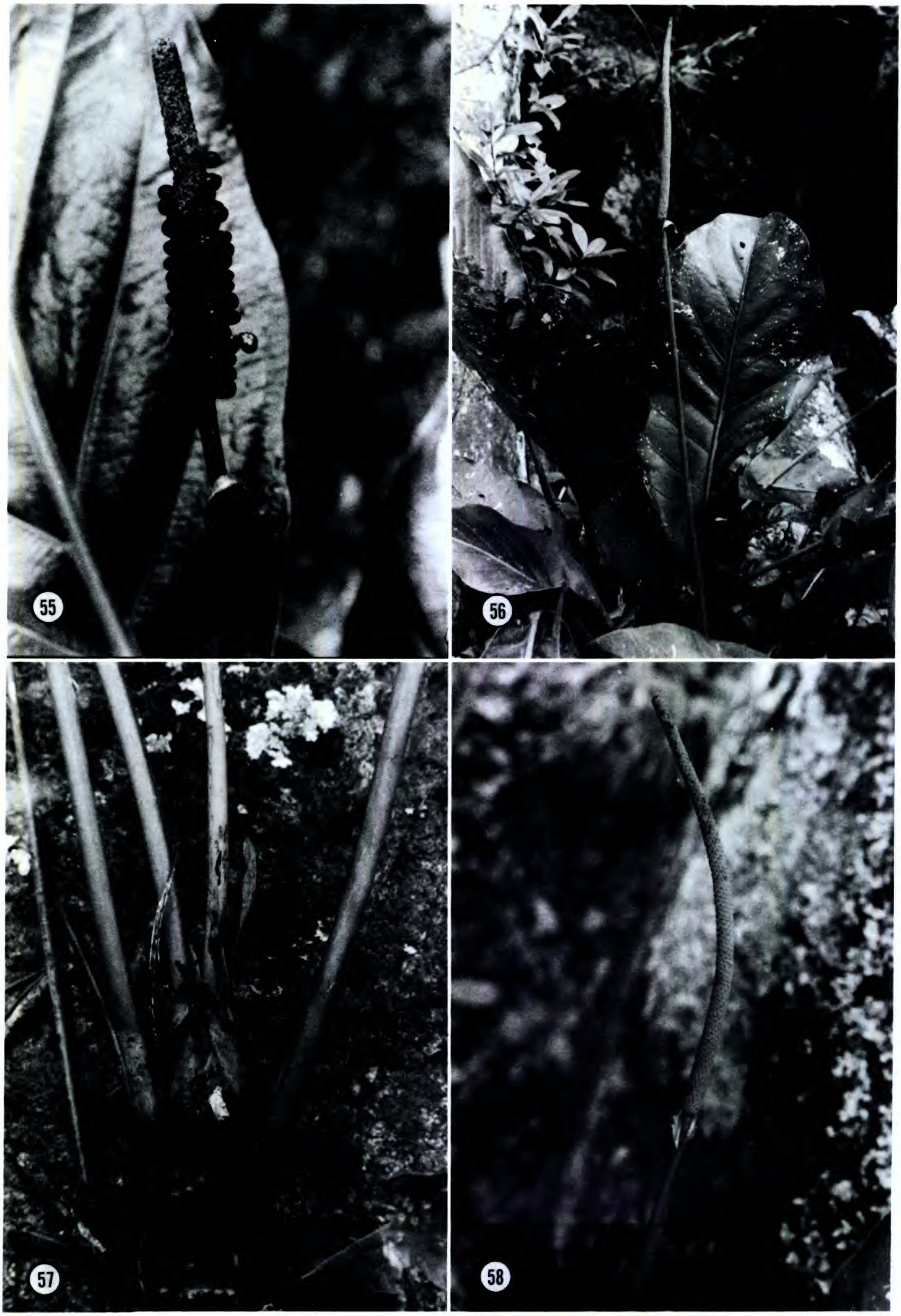




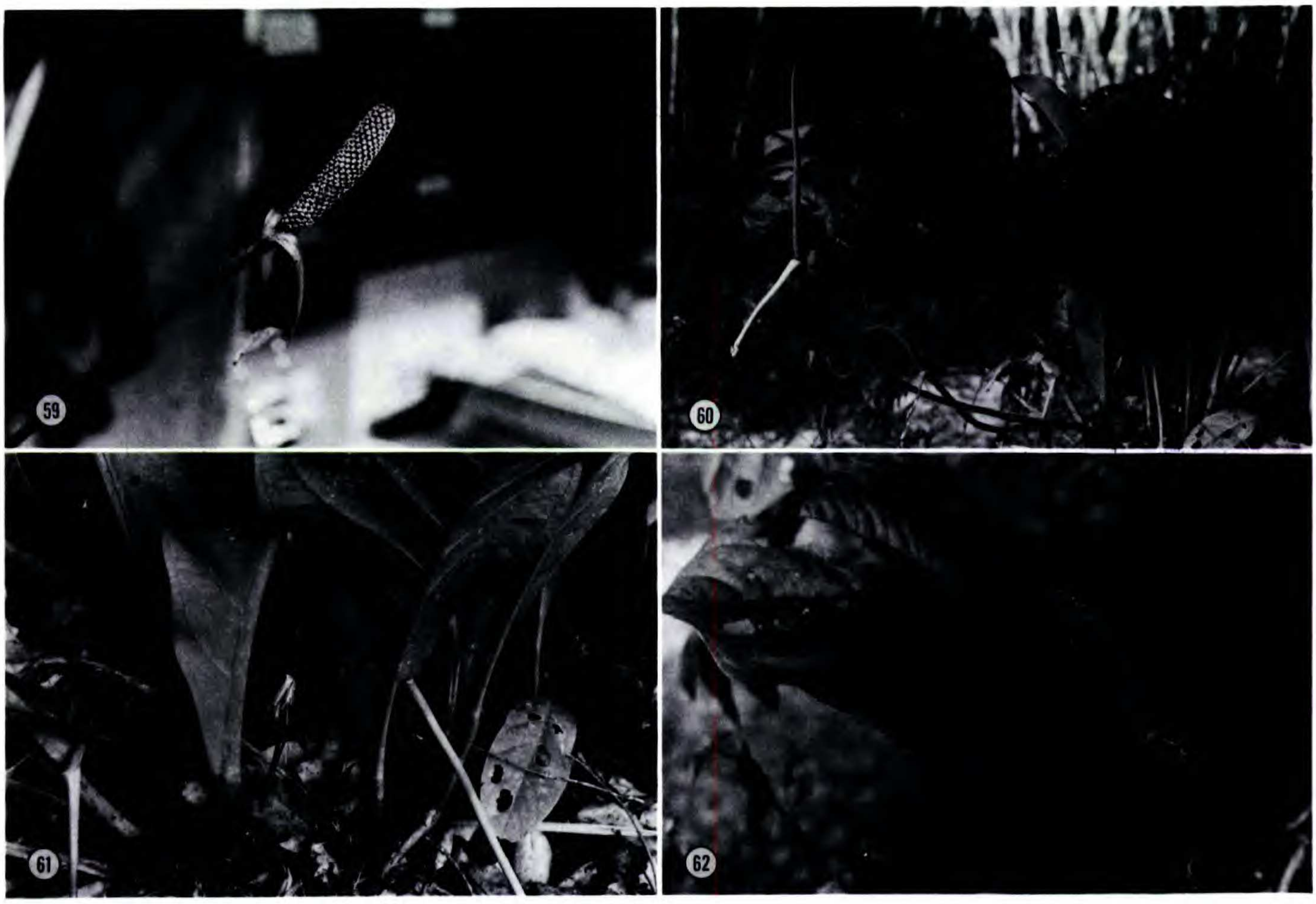
FIGURES 47–50.—47–49. *Anthurium barclayanum* Engl., *Croat 50702*.—50. *A. basirotundum* Croat, *Plowman 5980A*.



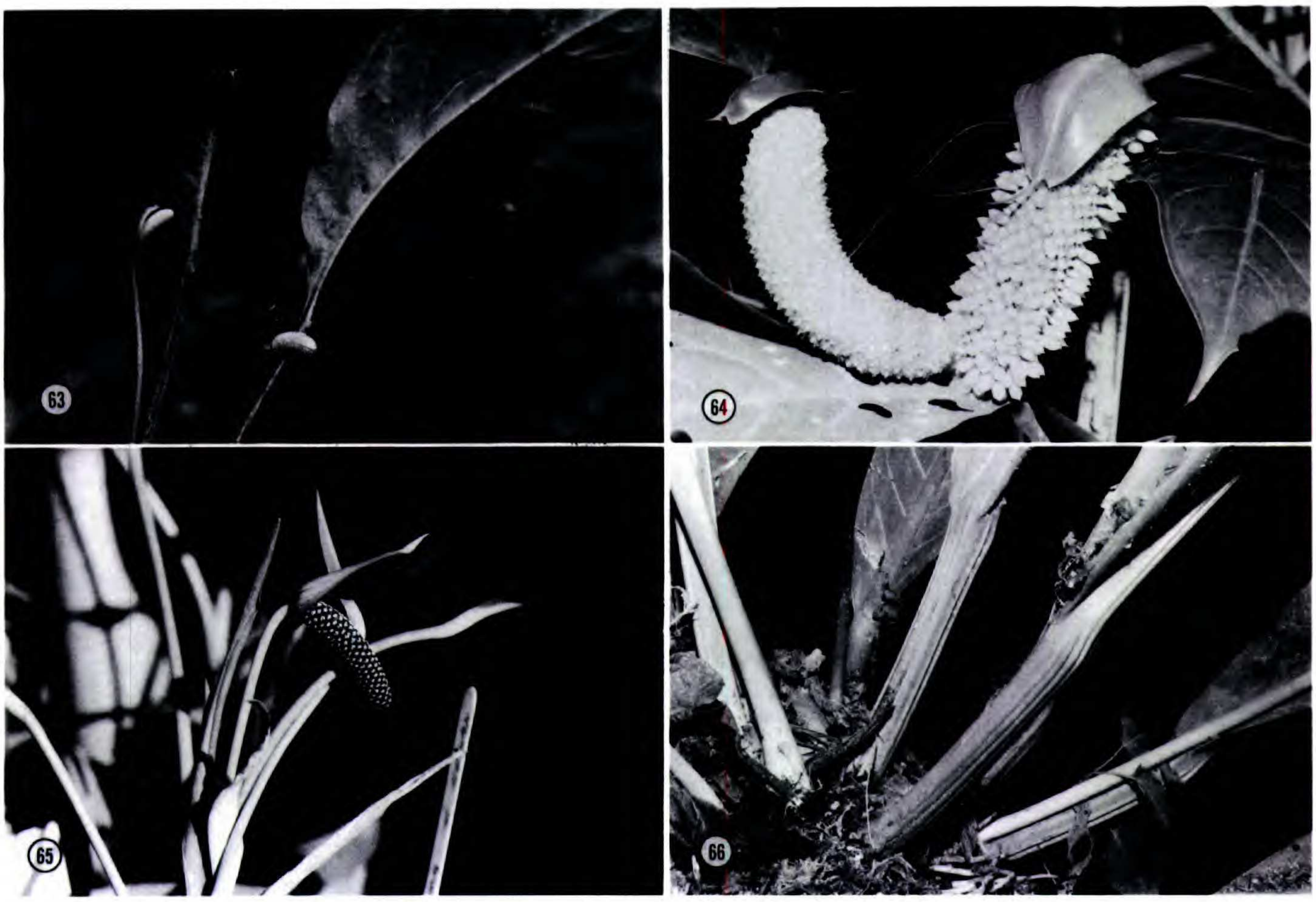
FIGURES 51–54.—51, 52. *Anthurium basirotundum* Croat, *Plowman 5980A.*—53. *A. bonplandii* Bunting subsp. *bonplandii, Croat 59326.*—54. *A. bonplandii* Bunting subsp. *bonplandii, Croat 59260.*



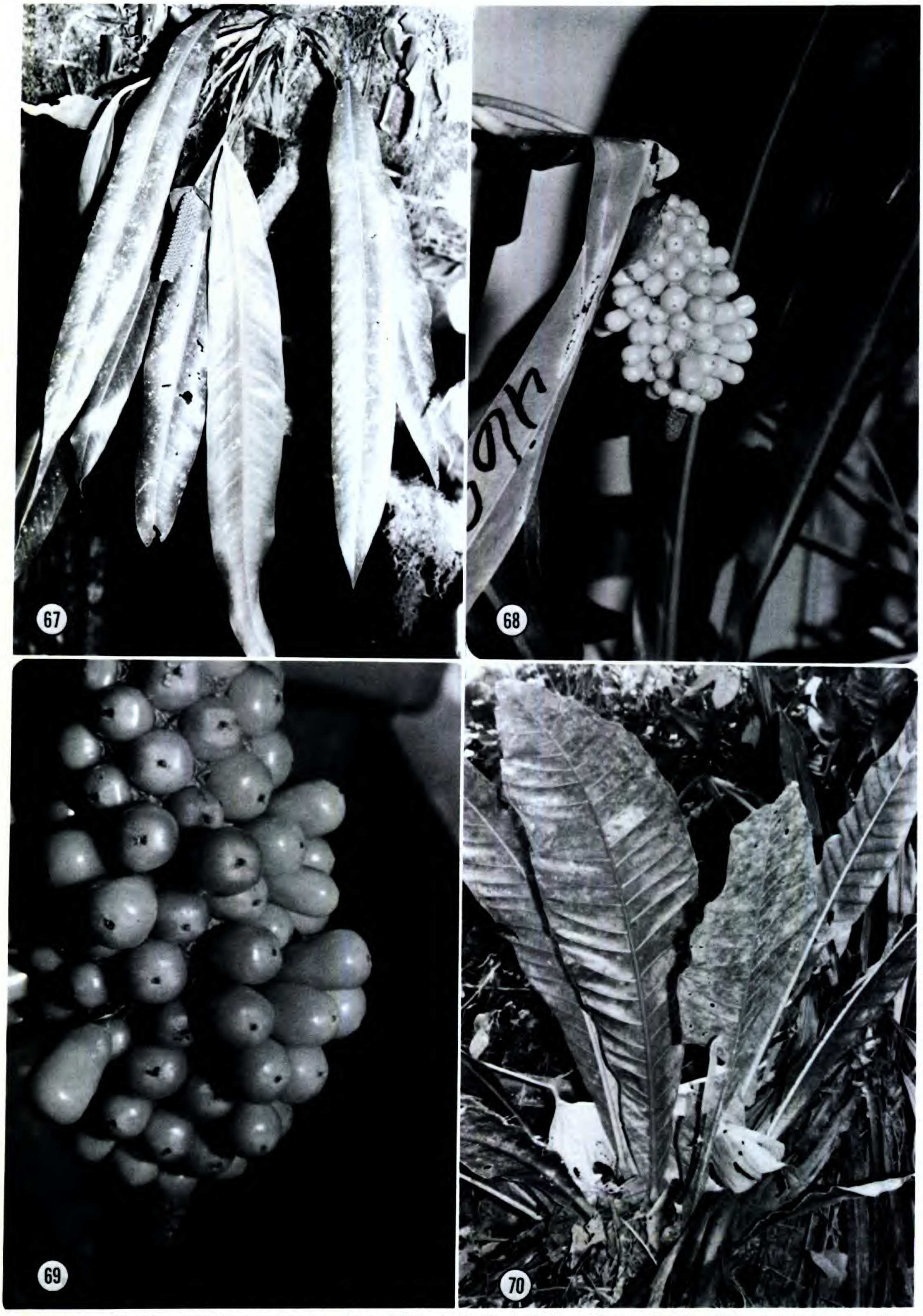
FIGURES 55–58.—55. *Anthurium bonplandii* Bunting subsp. *bonplandii, Croat 59260.*—56–58. *A. bonplandii* Bunting subsp. *cuatrecasii* Croat, *Croat 55065.*



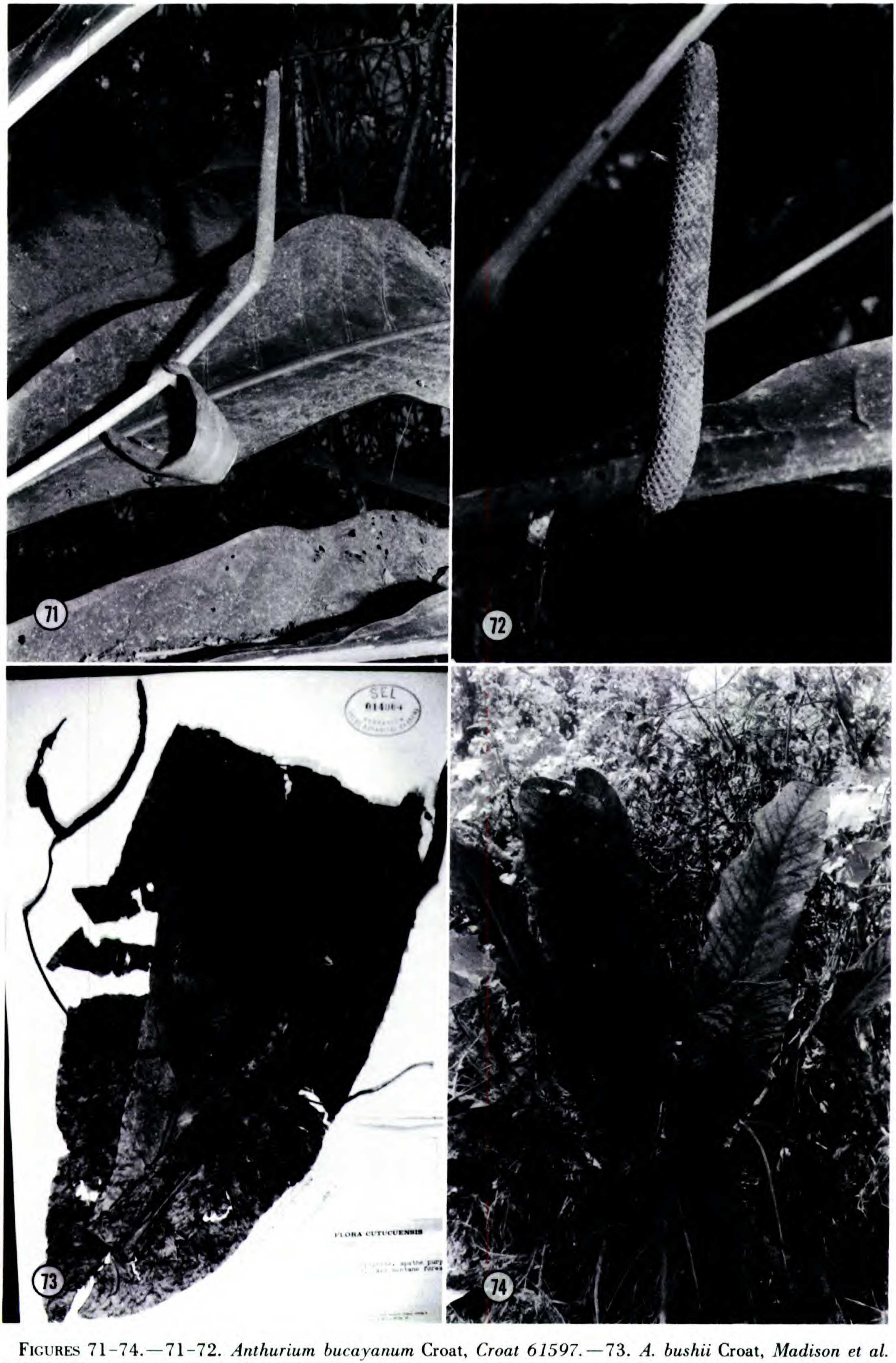
FIGURES 59–62.—59. *Anthurium barclayanum* Engl., *Thompson 373.*—60–62. *A. bonplandii* Bunting subsp. *guayanum* (Bunting) Croat, *Croat 54062.*



FIGURES 63–66.—63. *Anthurium bradeanum* Croat & Grayum, *Croat 35751.*—64. *A. bradeanum* Croat & Grayum, *Croat 36480A.*—65. *A. brenesii* Croat & R. A. Baker, *Croat 46923.*—66. *A. bucayanum* Croat, *Croat 61597.*



FIGURES 67–70.—67–69. *Anthurium brenesii* Croat & R. A. Baker, *Croat 46923*.—70. *A. bucayanum* Croat, *Croat 50912*.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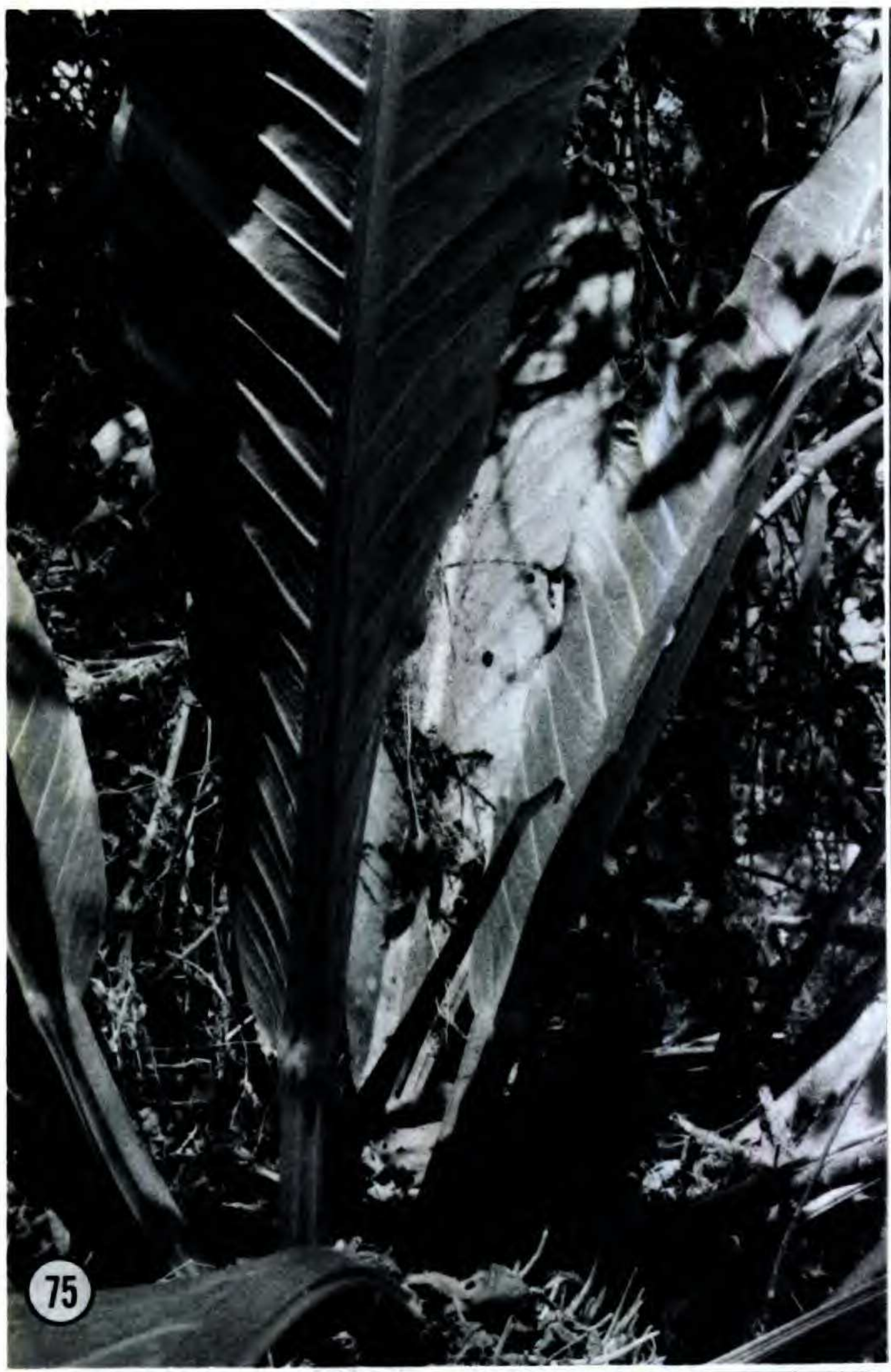
FIGURES 71-74.—71-72. *Anthurium bucayanum* Croat, *Croat 61597*.—73. *A. bushii* Croat, *Madison et al. 3285*.—74. *A. campii* Croat, *Croat 61562*.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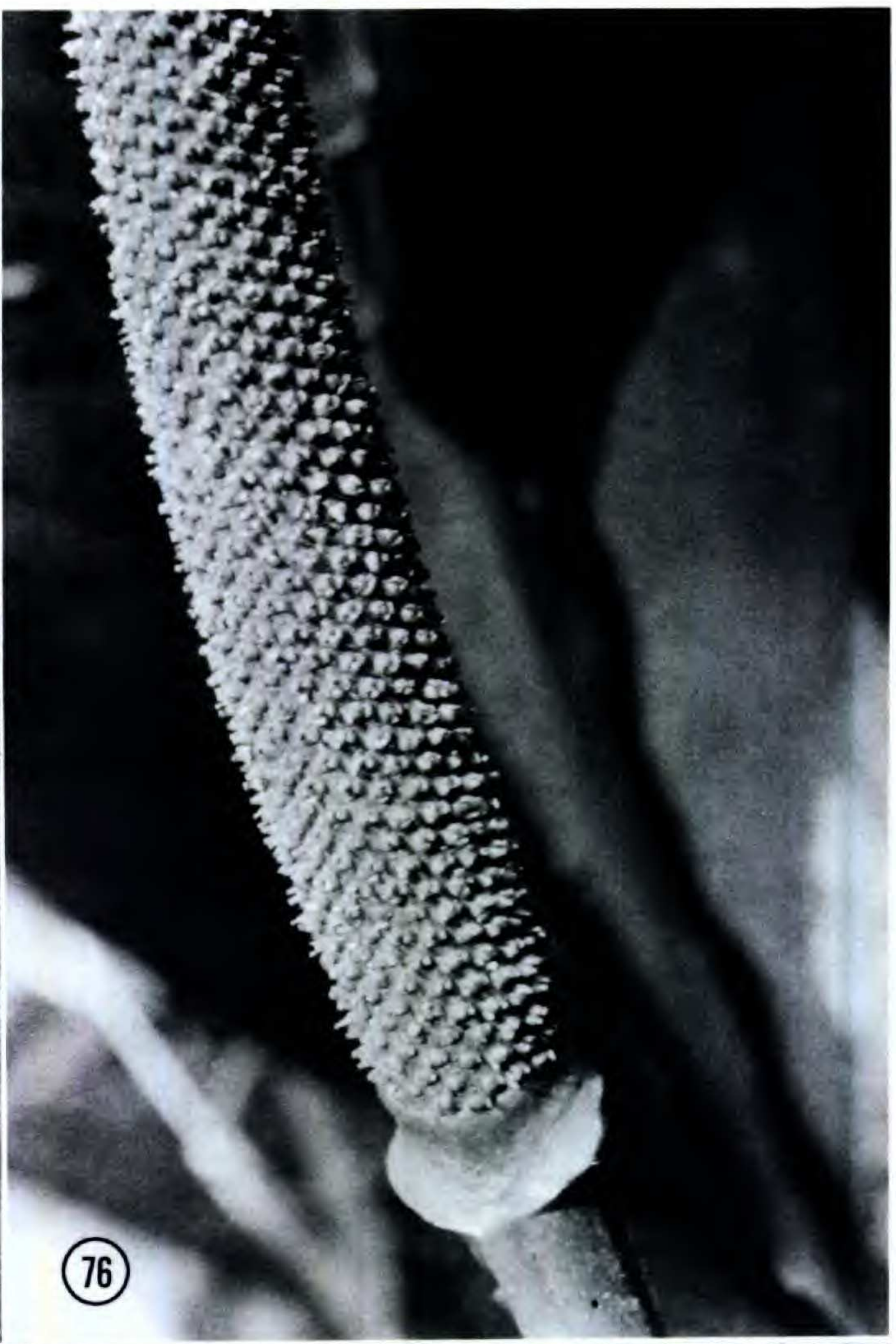
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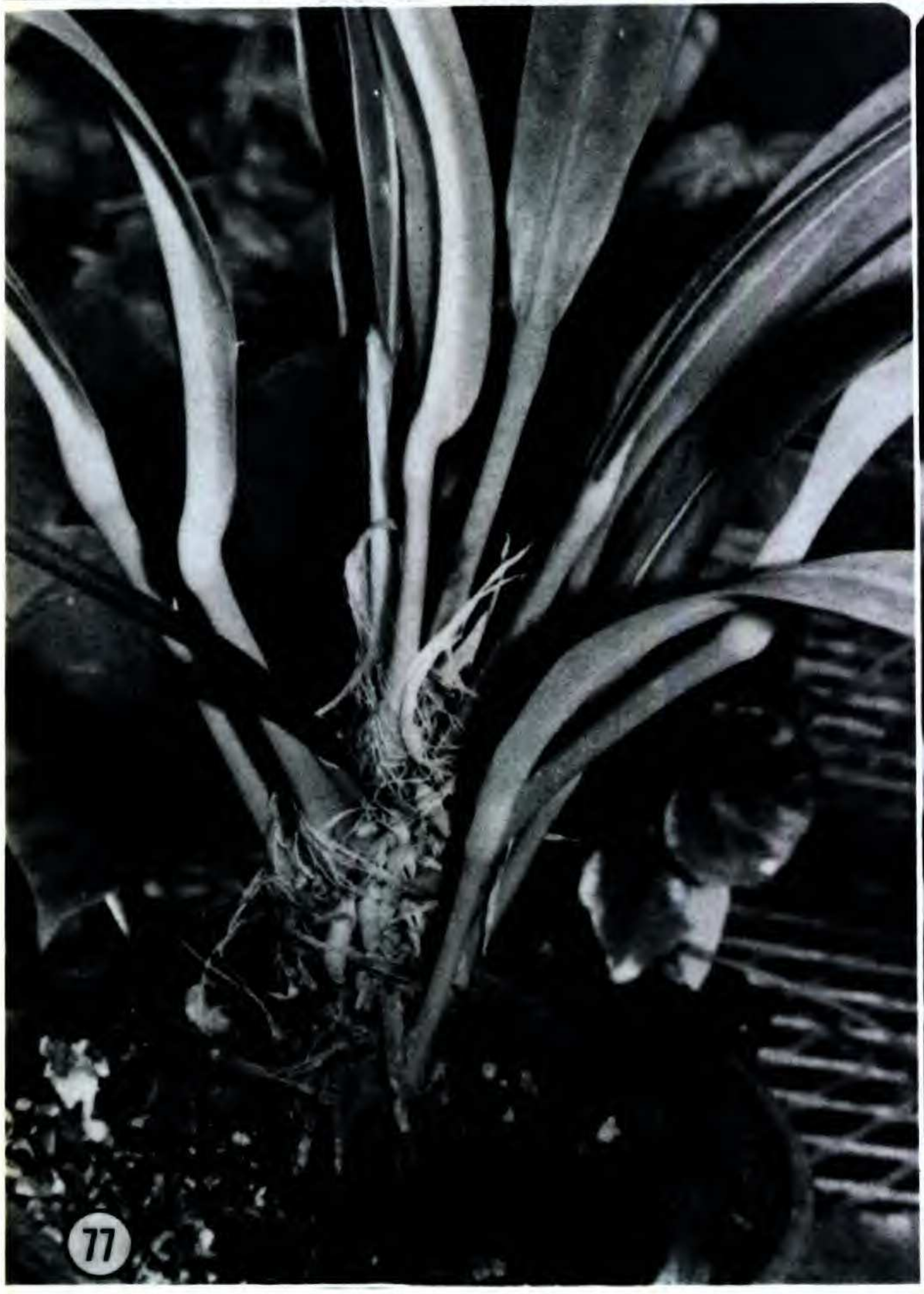
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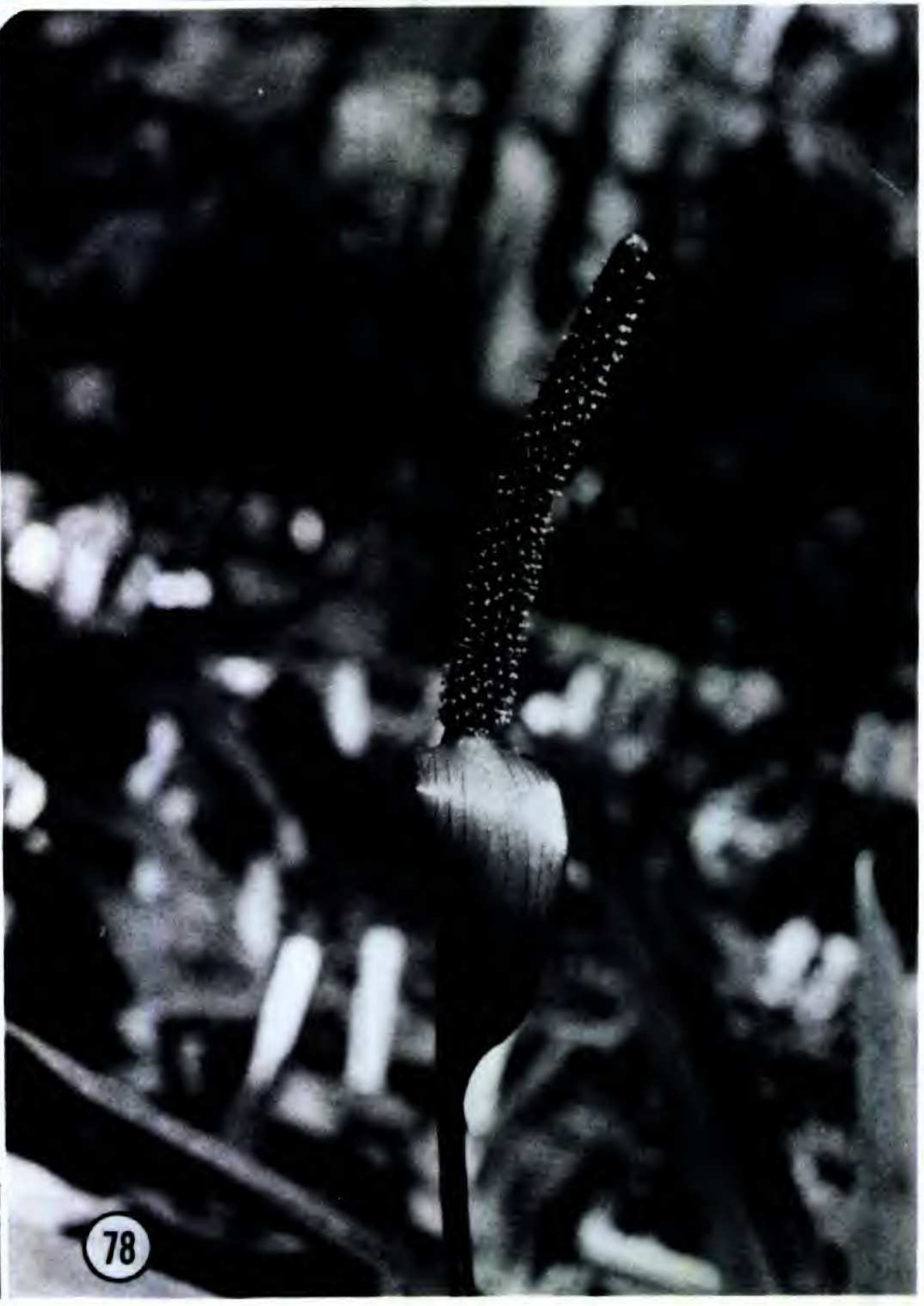
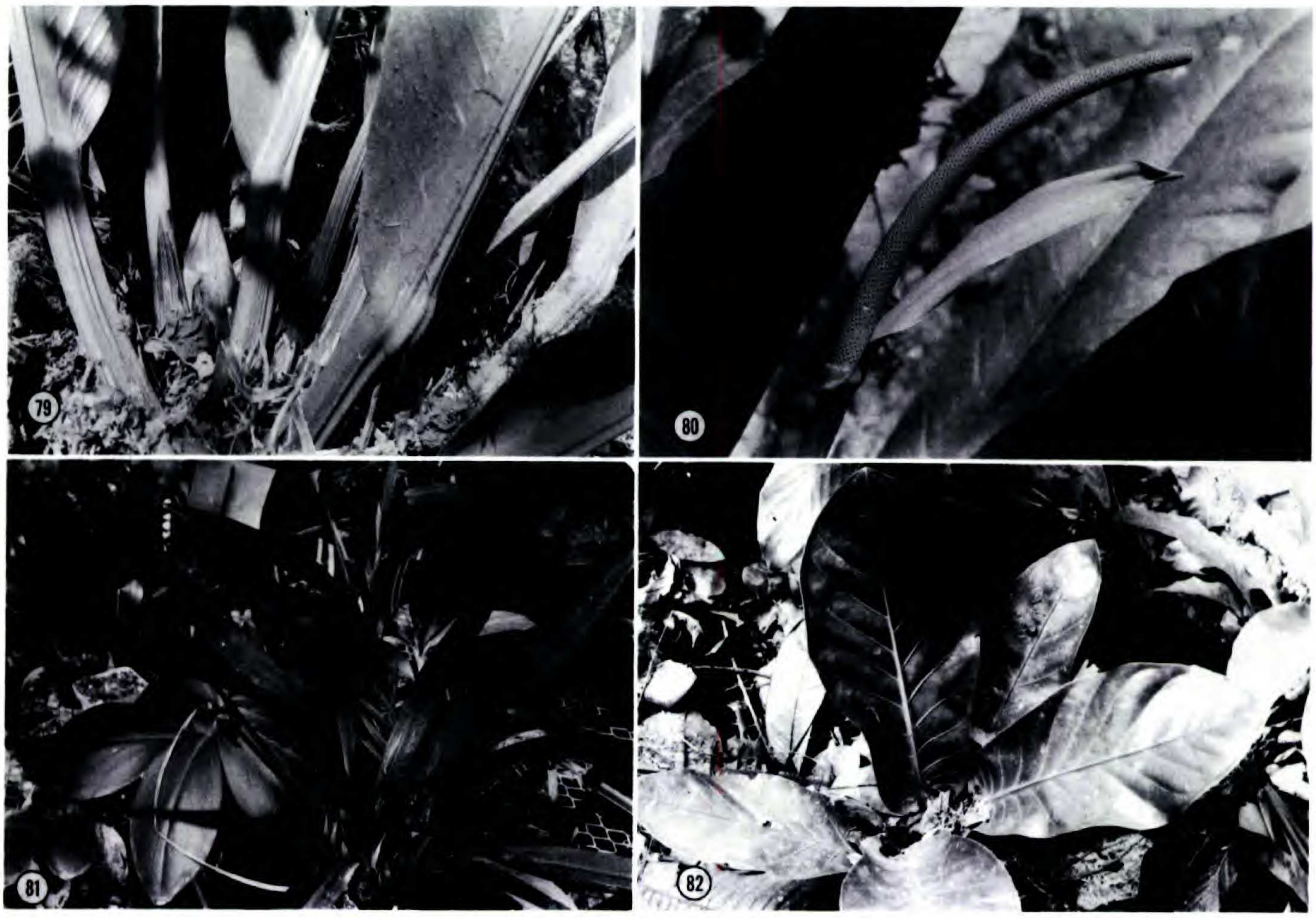
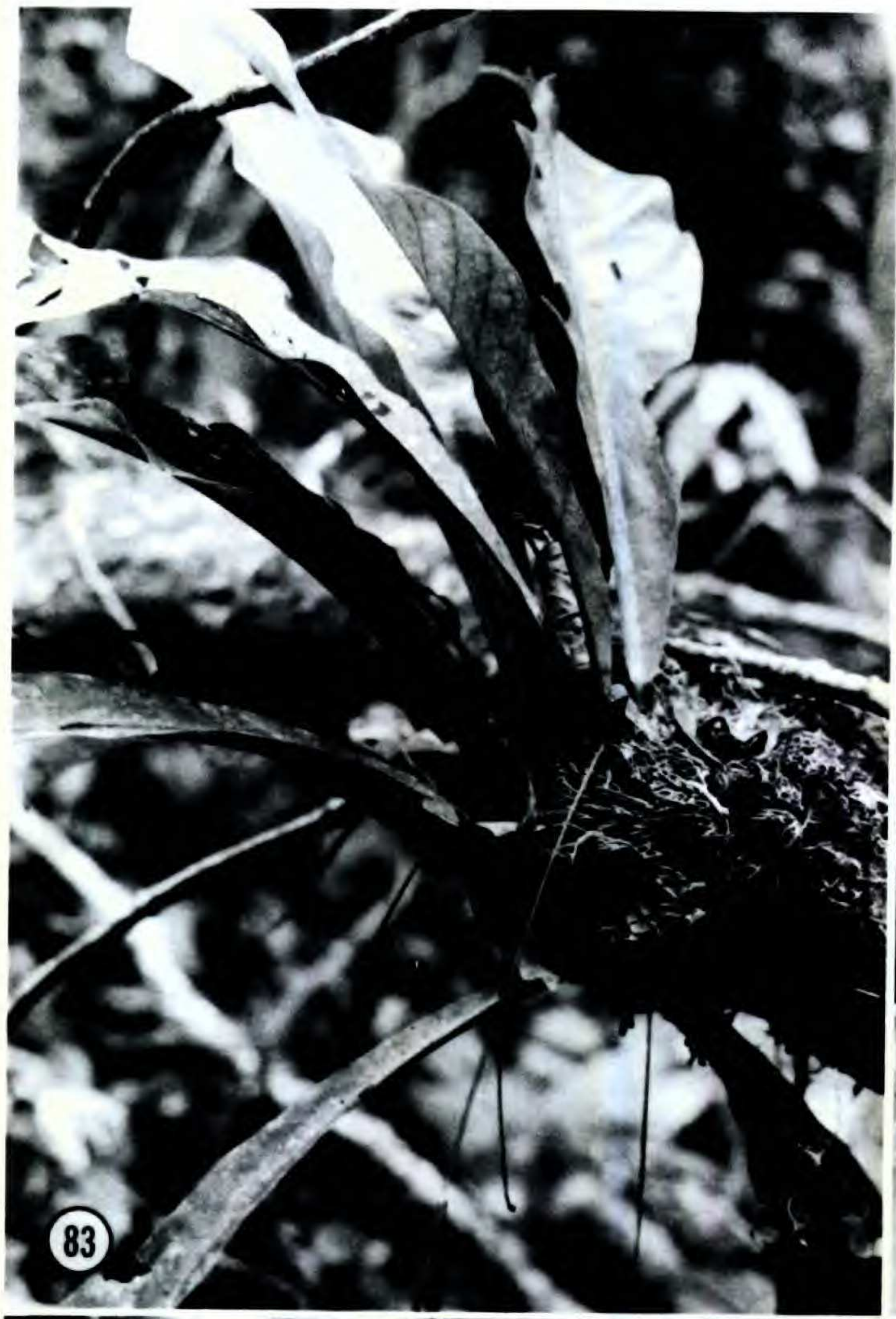

(78)

FIGURES 75–78.—75, 76. *Anthurium campii* Croat, *Croat 61562.*—77, 78. *A. carchiense* Croat, *Madison 3998.*



FIGURES 79–82.—79–80. *Anthurium campii* Croat, *Croat 61562*.—81. *A. carchiense* Croat, *Madison 3998*.—82. *A. cataniapoense* Croat, *Croat 59319*.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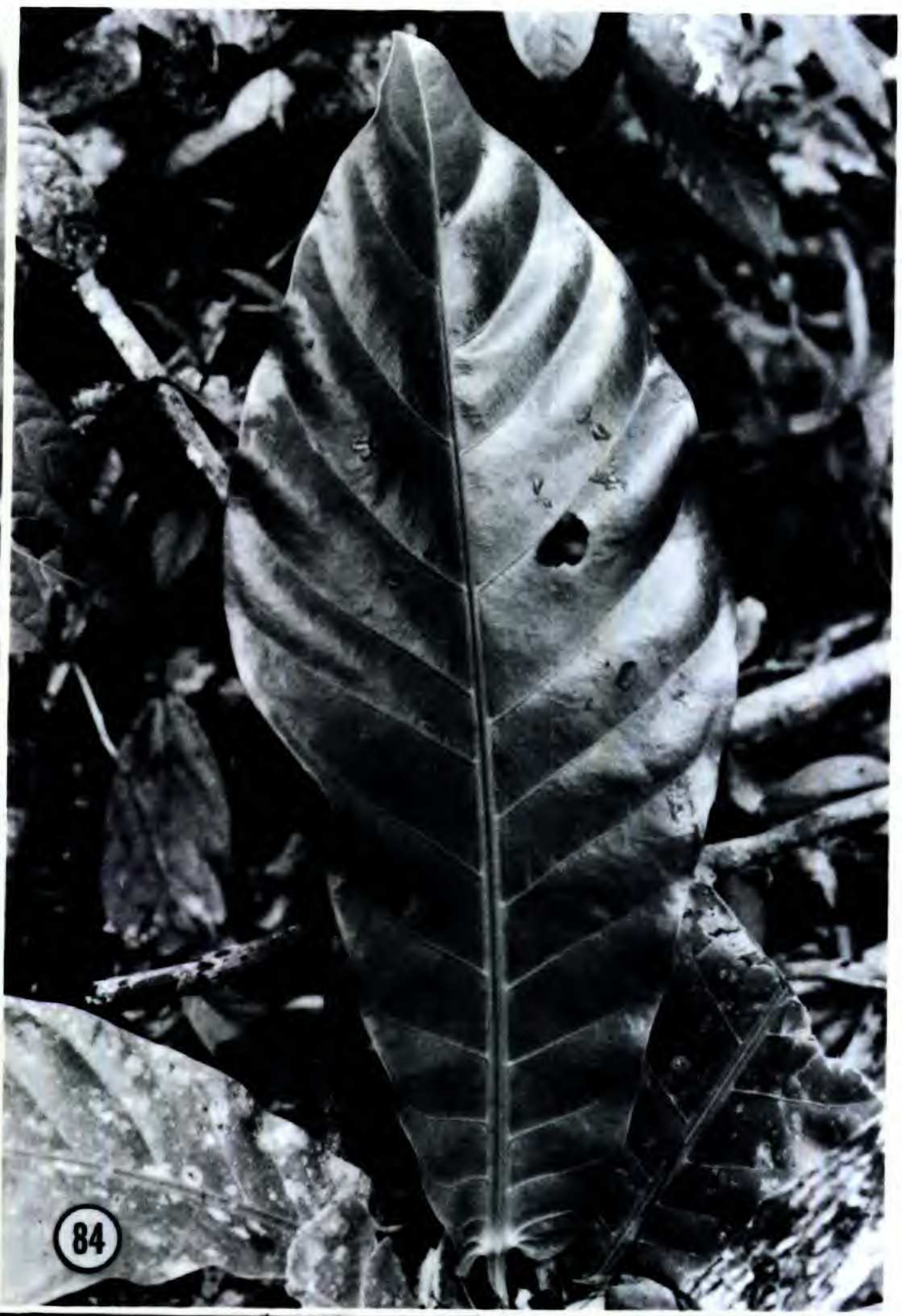
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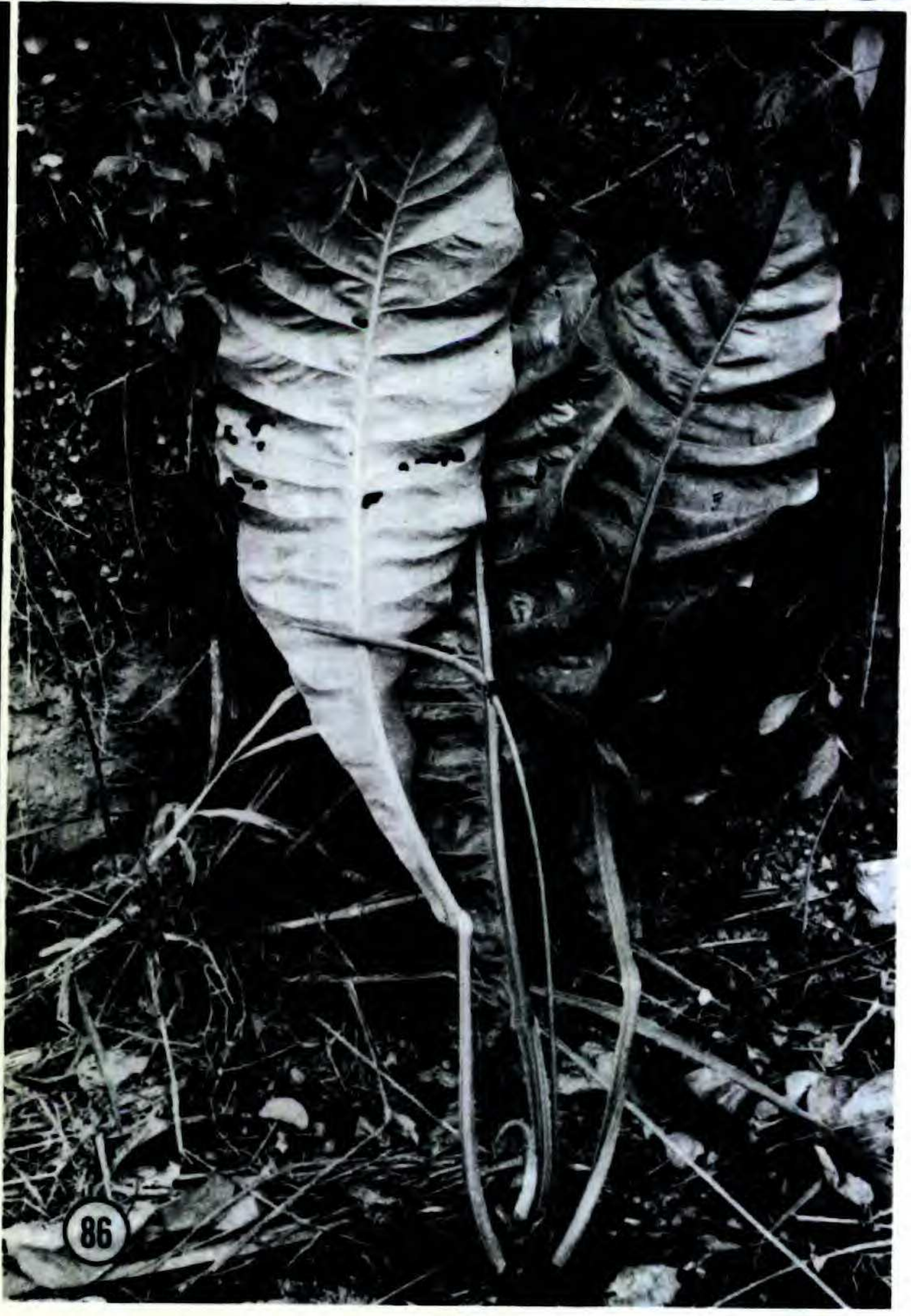
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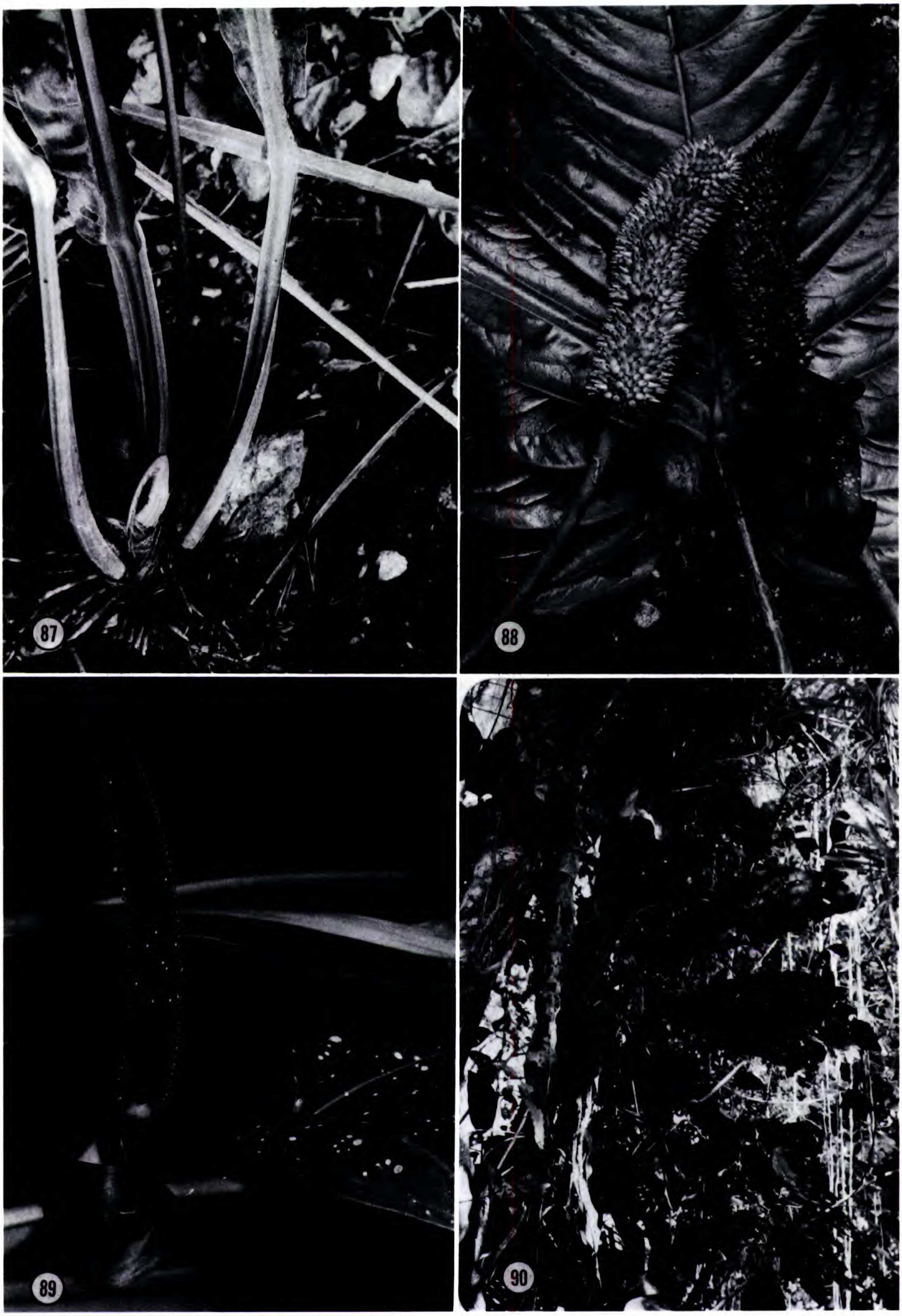
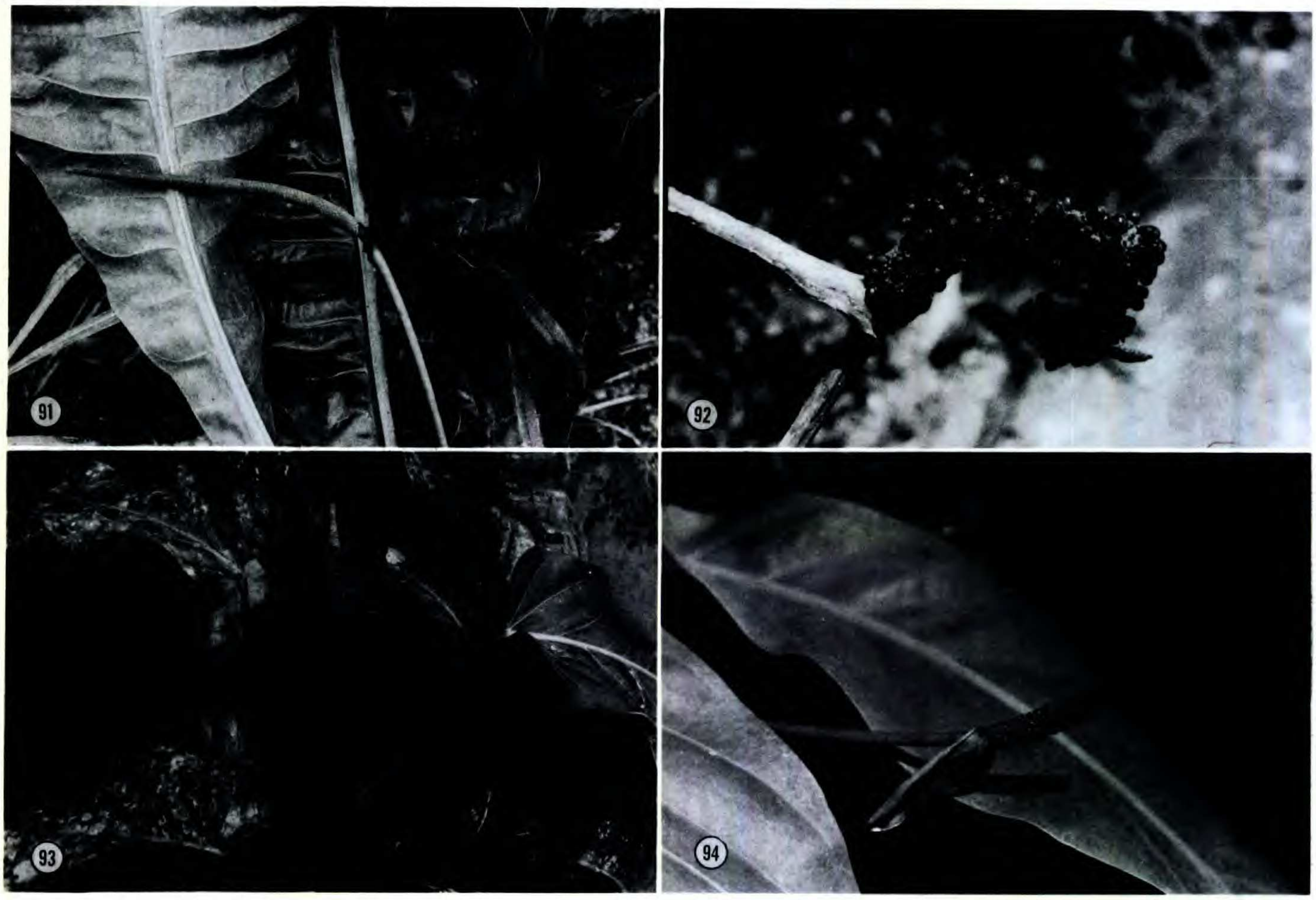
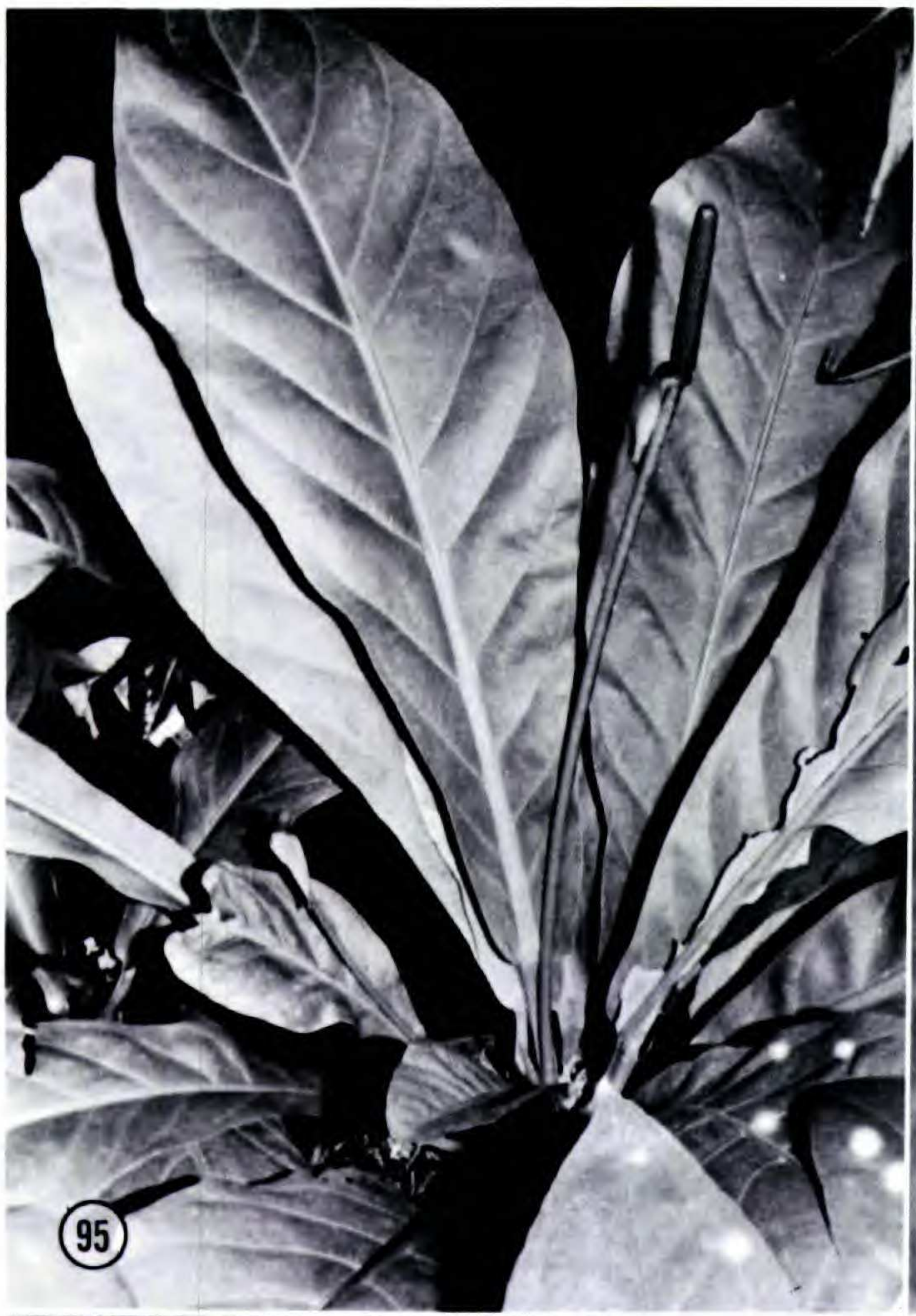
FIGURES 83–86.—83–85. *Anthurium cataniapoense* Croat, *Croat 59319.*—86. *A. caucavallense* Croat, *Croat 56729.*



FIGURES 87–90.—87. *Anthurium caucavallense* Croat, *Croat 56729.*—88. *A. colonicum* K. Krause, *Croat 25831*, specimen destroyed.—89. *A. colonicum* K. Krause, *Croat 33640.*—90. *A. concolor* K. Krause, *Croat 33637.*



FIGURES 91–94.—91, 92. *Anthurium caucavallense* Croat, *Croat 56729*.—93. *A. colonicum* K. Krause, *Croat 33519*.—94. *A. concolor* K. Krause, *Croat 33637*.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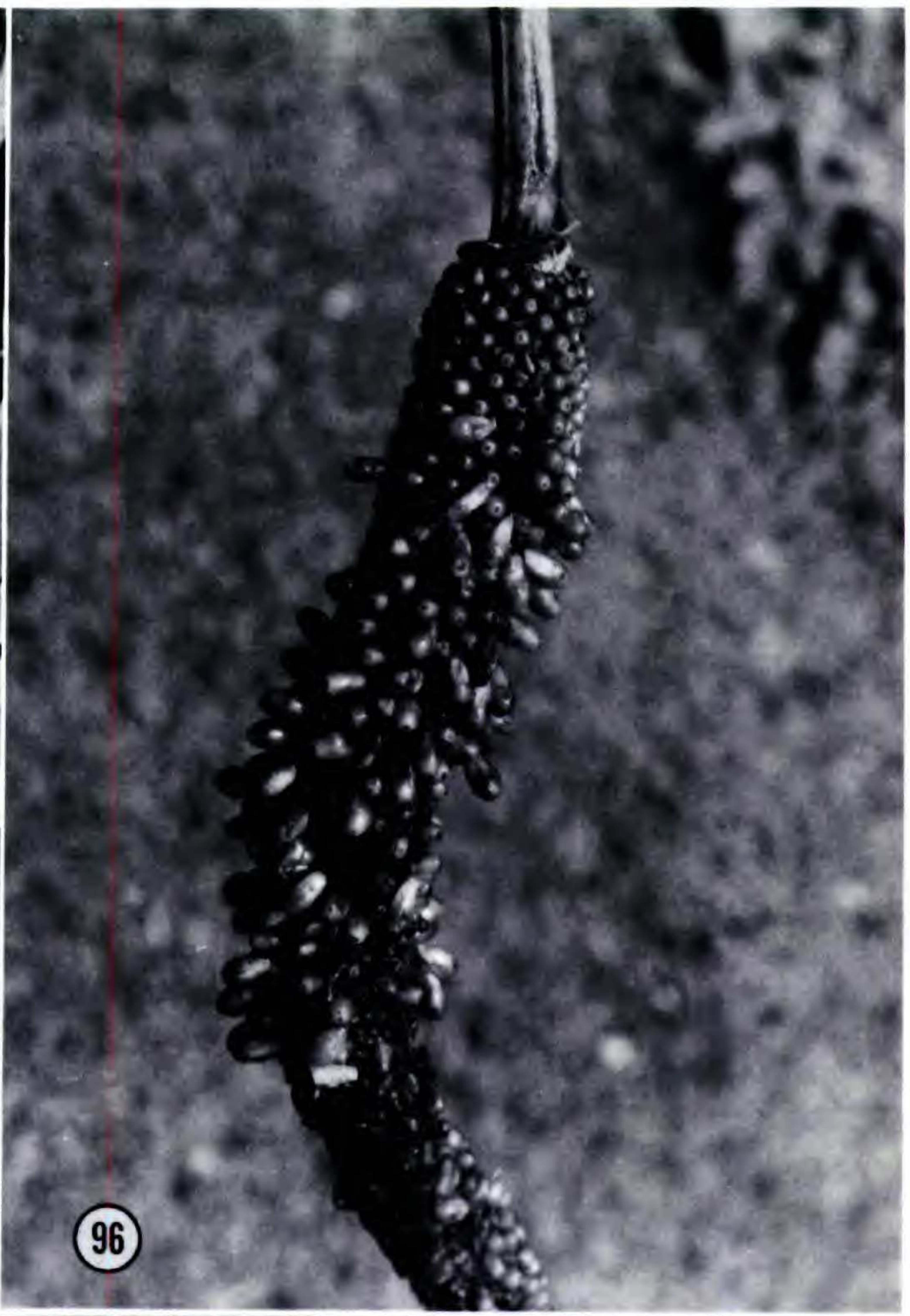
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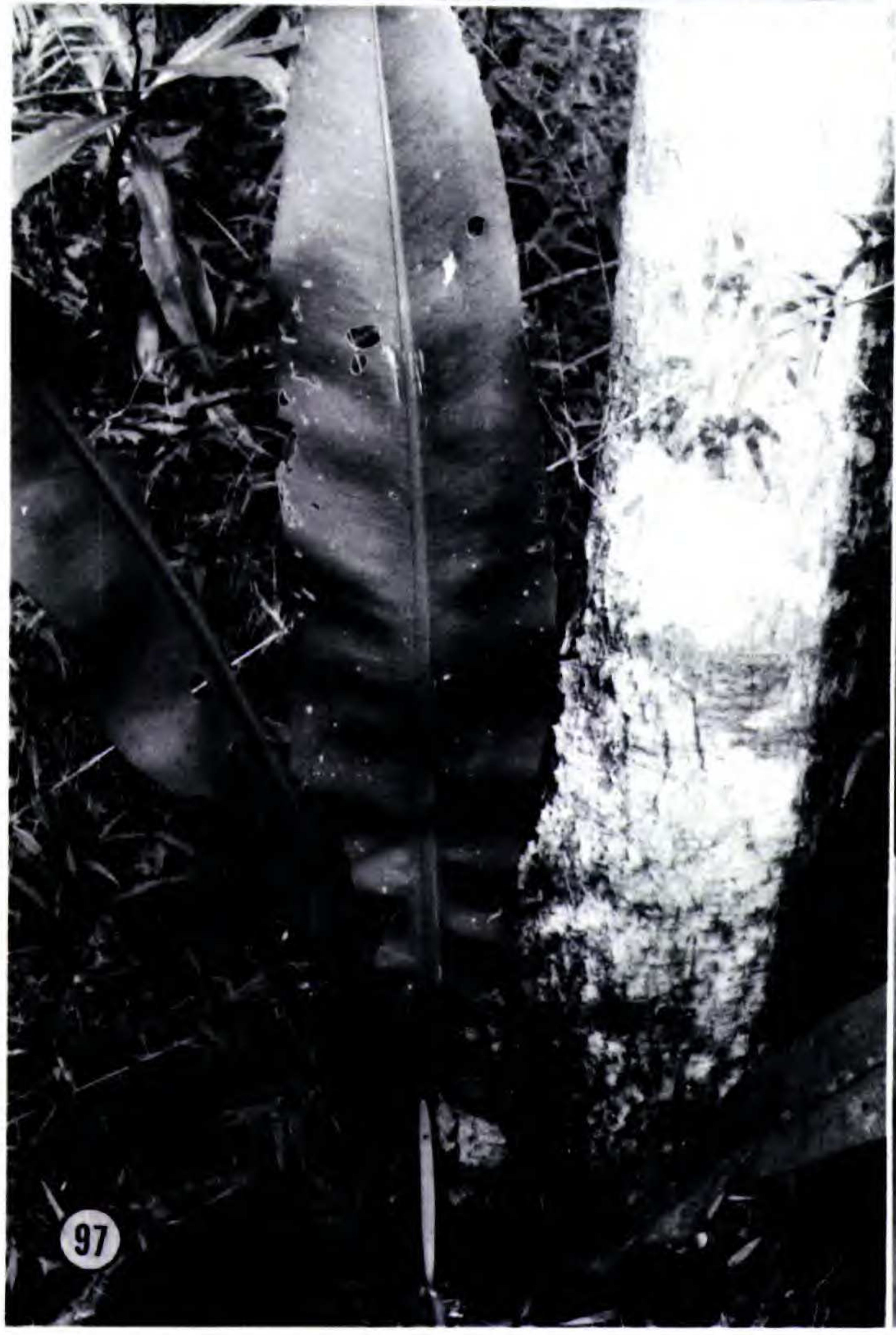
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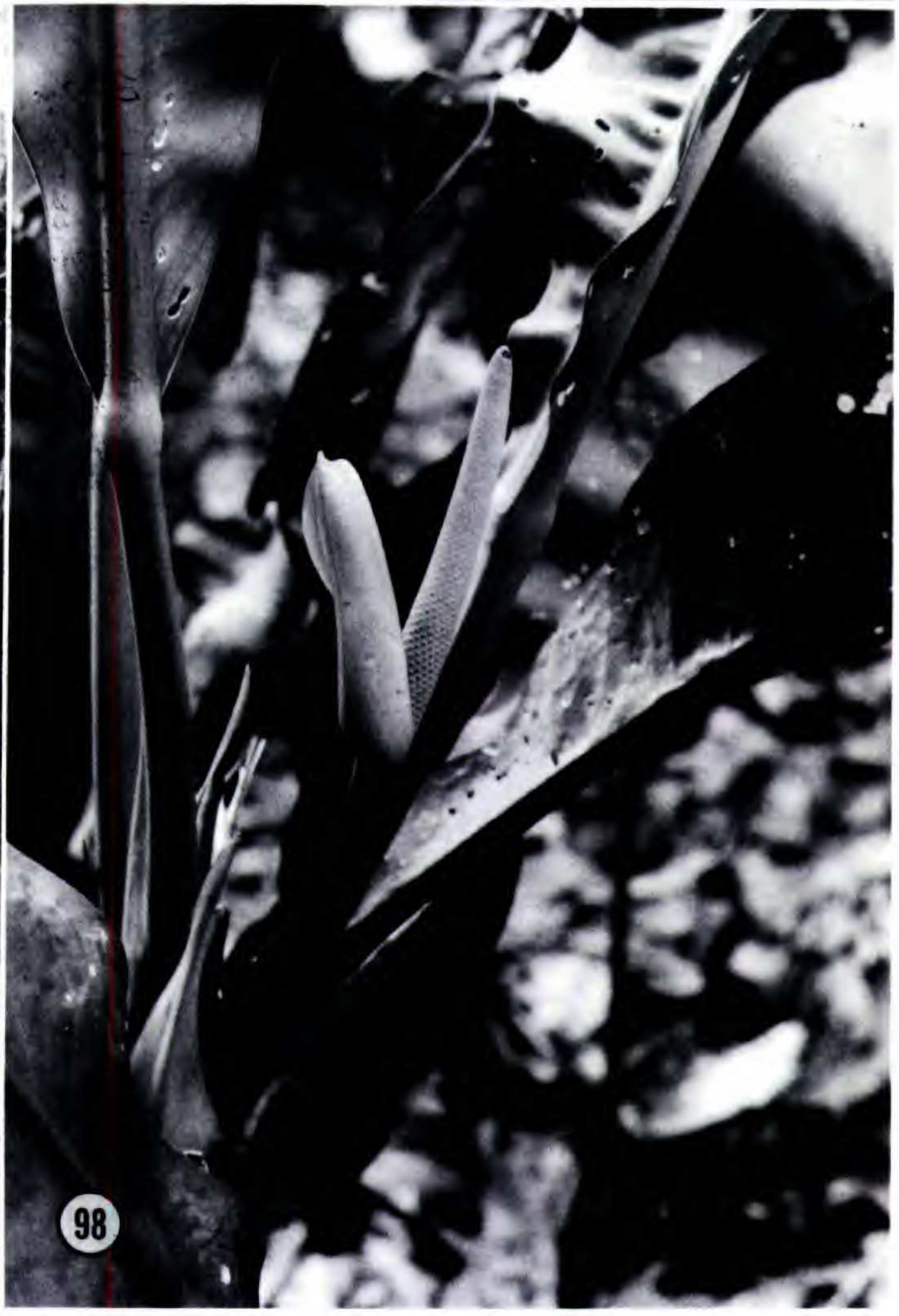
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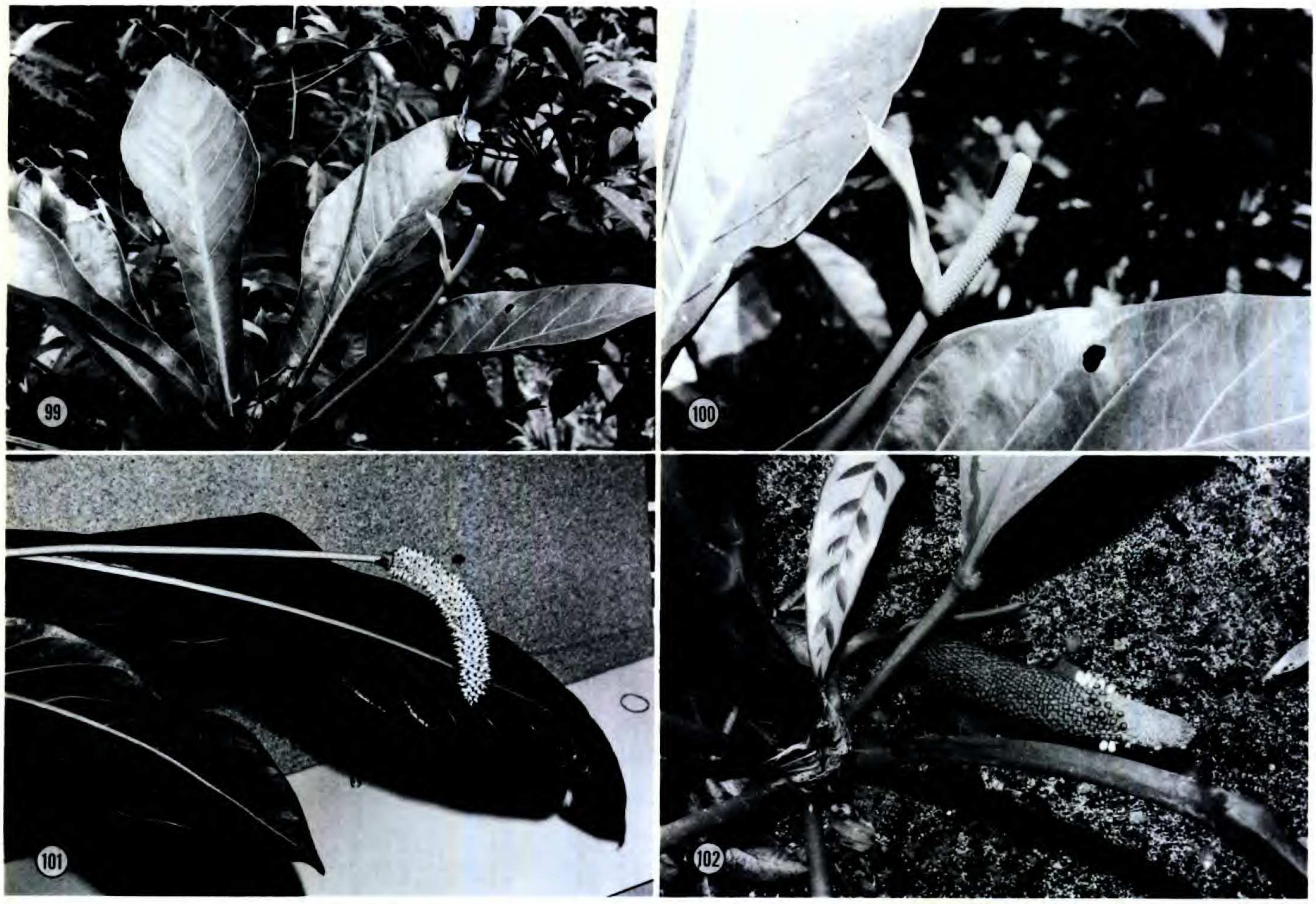
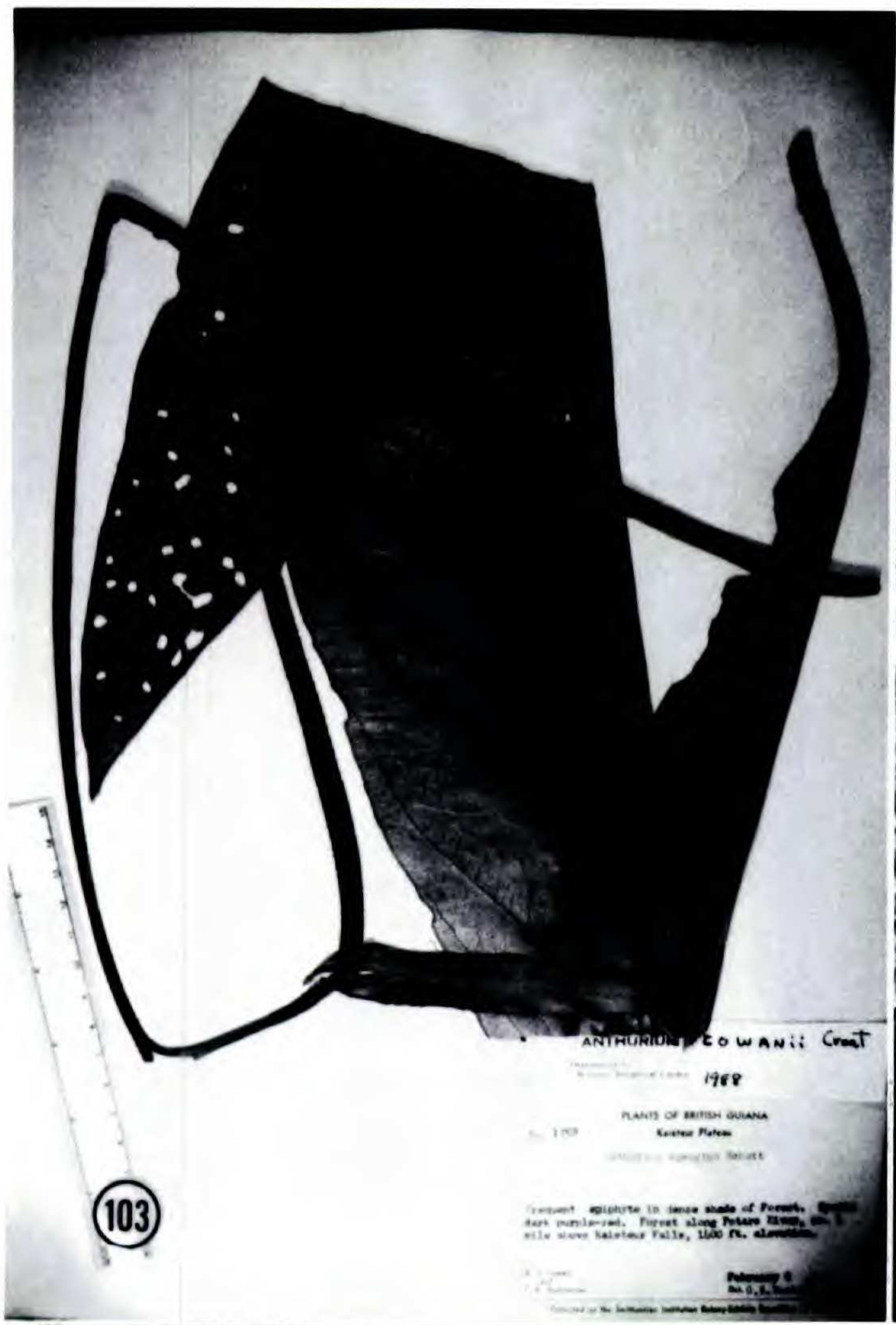
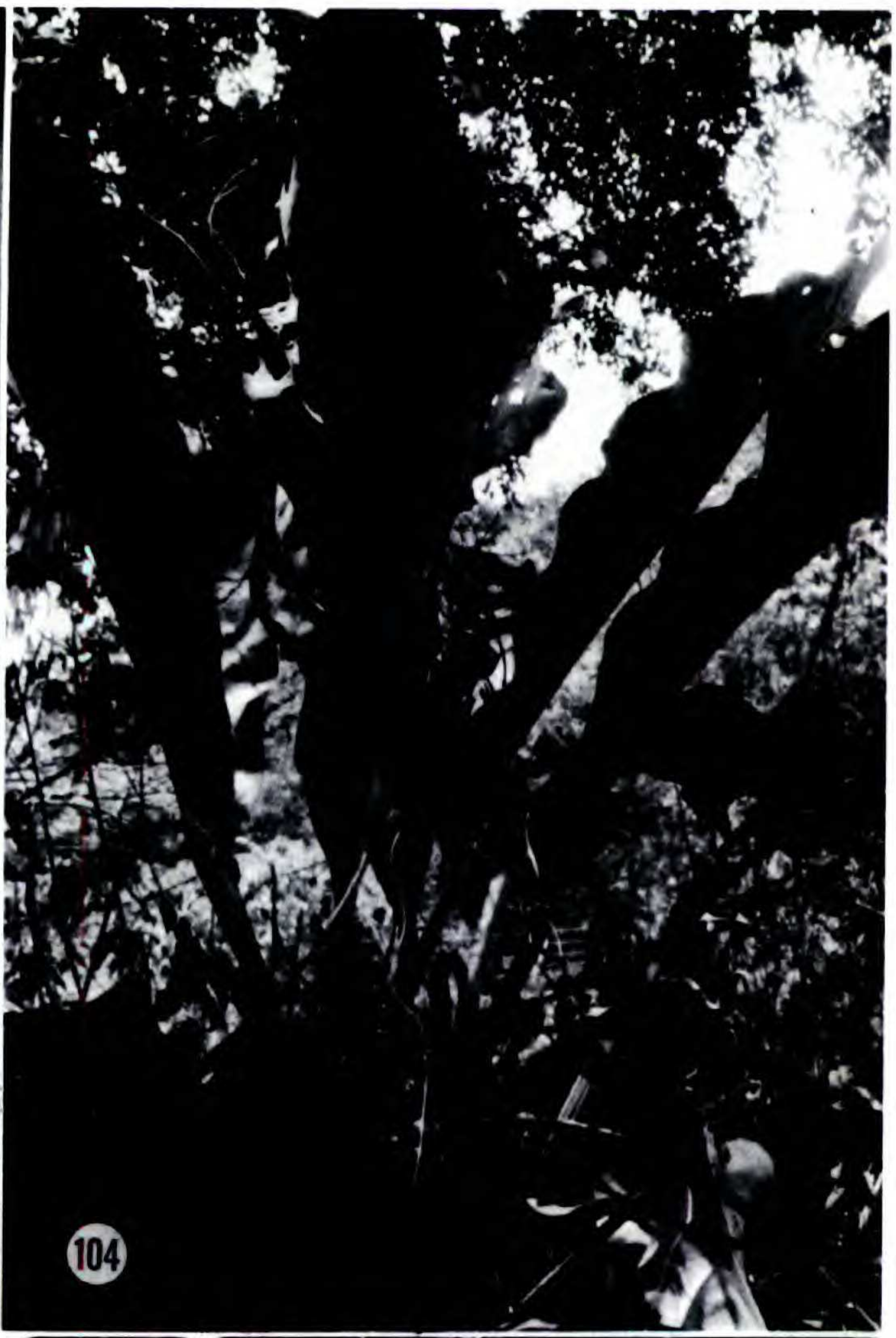
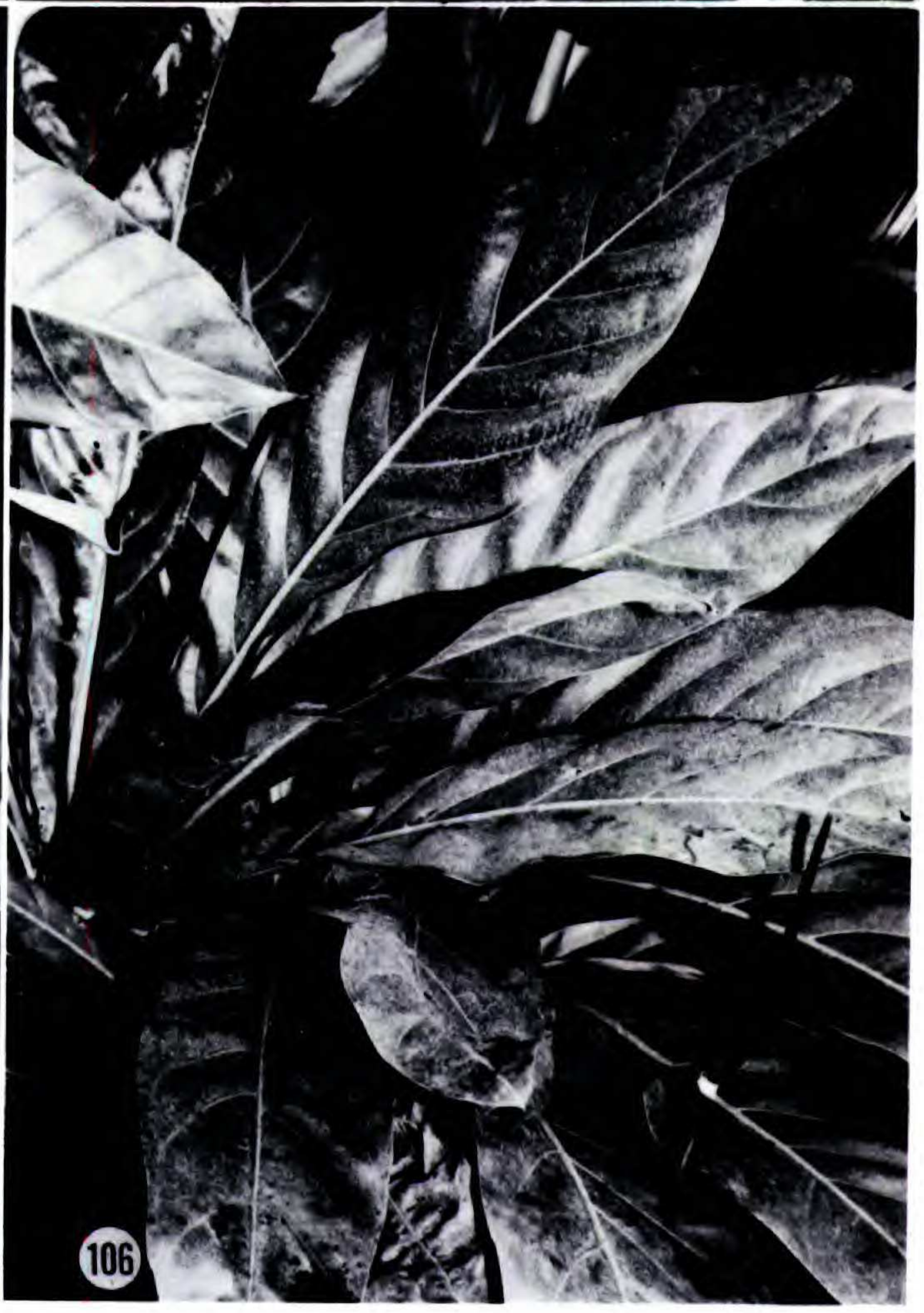
FIGURES 95-98.—95, 96. *Anthurium concolor* K. Krause, *Croat 33637*.—97. *A. coriaceum* G. Don in Sweet, *Croat 53757*.—98. *A. coriaceum* G. Don in Sweet, cultivated by Burle-Marx.



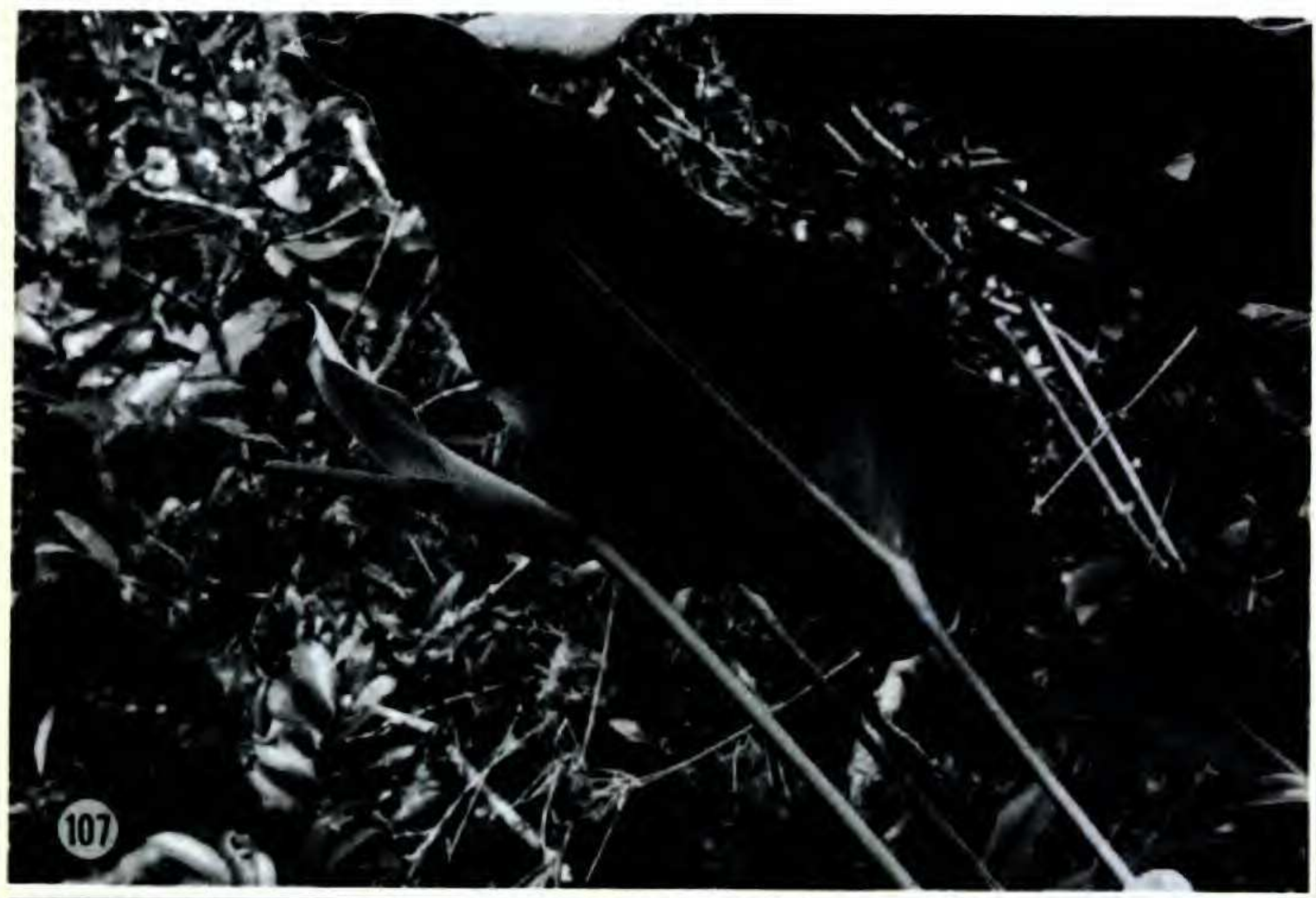
FIGURES 99-102.—99, 100. *Anthurium consobrinum* Schott, cultivated at Las Cruces Bot. Gard. (*#75-375*).—101. *A. consobrinum* Schott, *Burger & Baker 151*.—102. *A. coriaceum* G. Don in Sweet, cultivated at Prague.

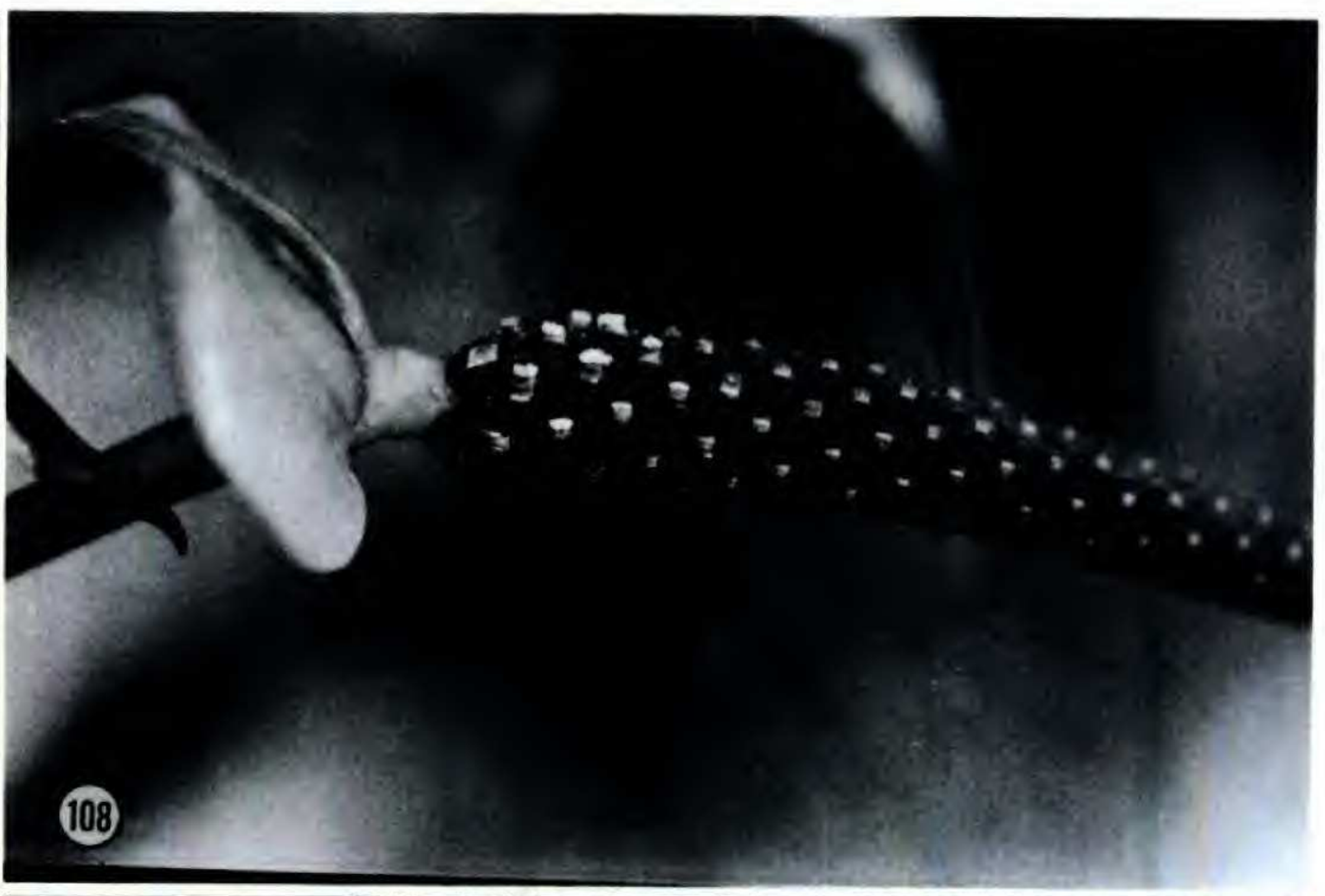

ANTHURIUM COWANII Croat
1988
PLANTS OF BRITISH GUIANA
Kaieteur Plateau
103

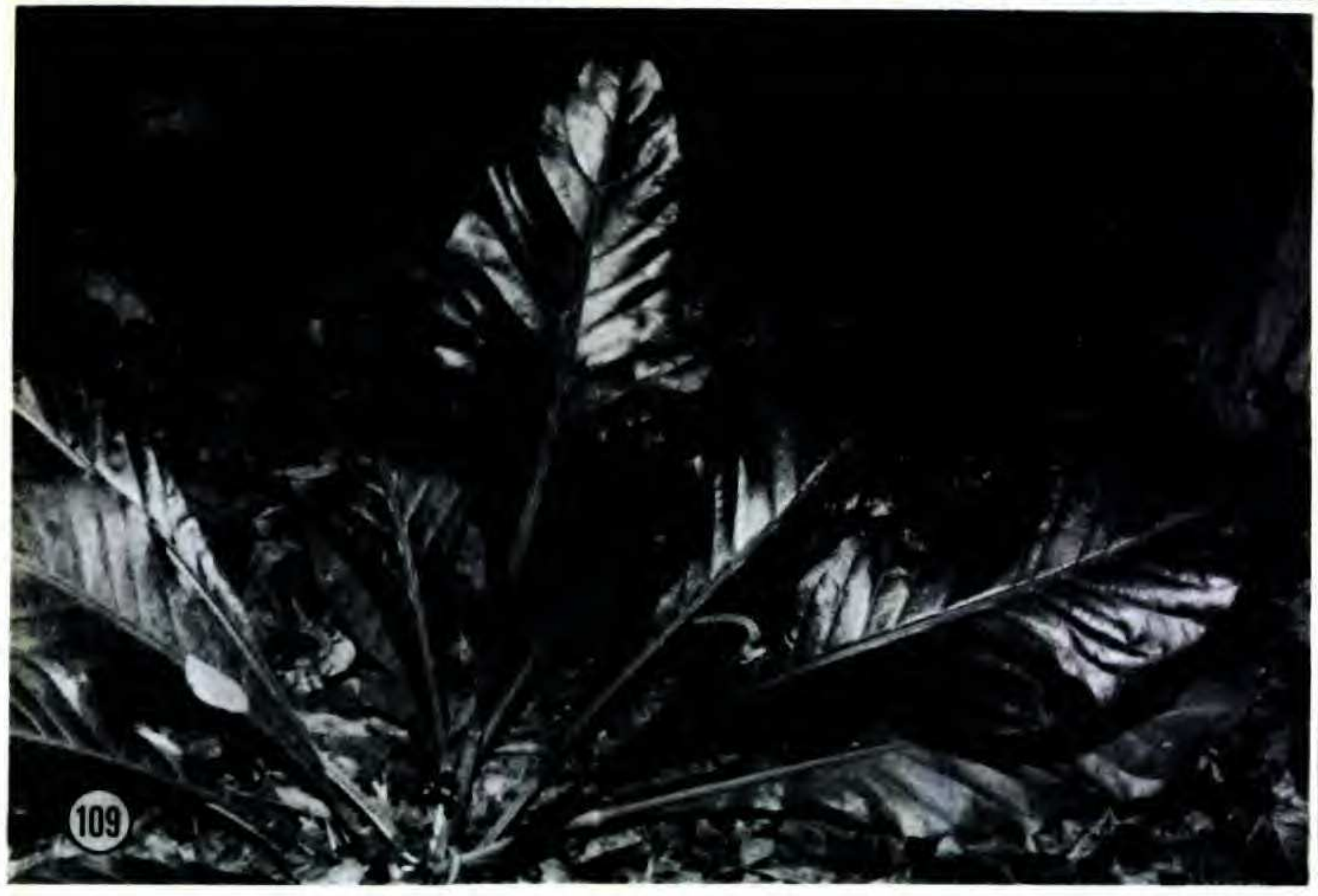


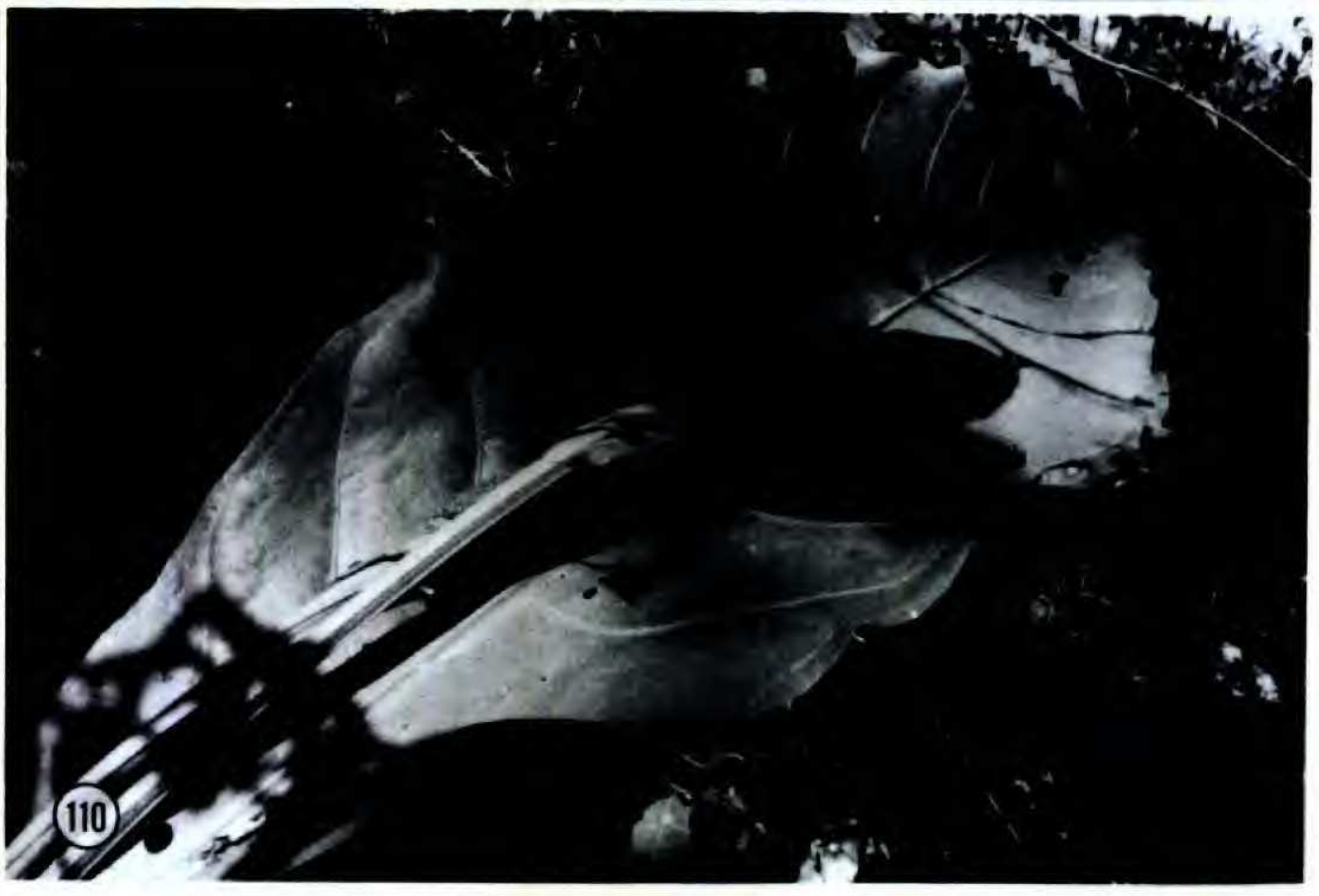


FIGURES 103–106.—103. *Anthurium cowanii* Croat, *Cowan & Soderstrom 1758*.—104. *Anthurium crassinervium* (Jacq.) Schott, *Croat 60621*.—105. *A. crassinervium* (Jacq.) Schott, *Croat 38338*.—106. *A. crenatum* (L.) Kunth, cultivated at Kew.

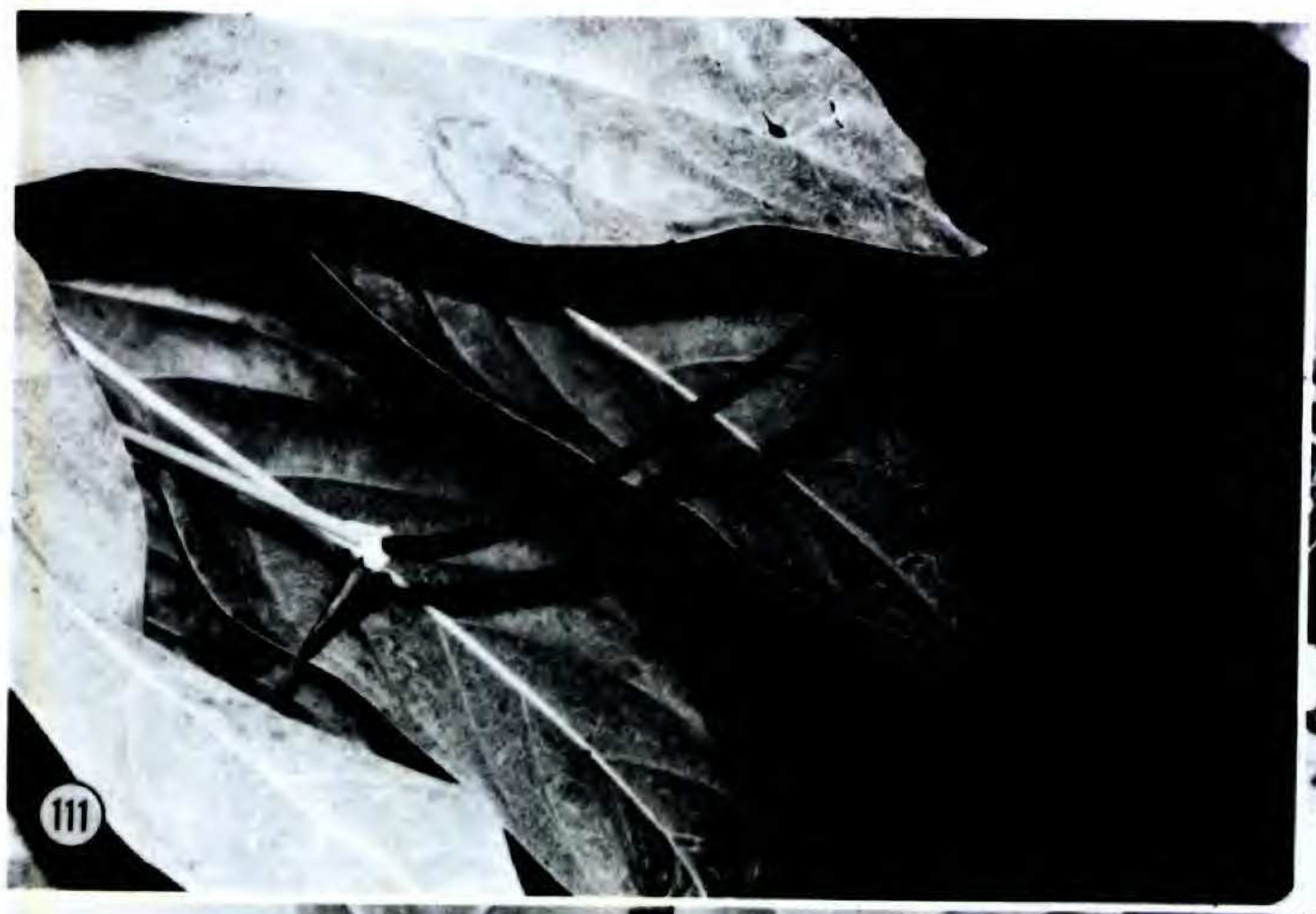


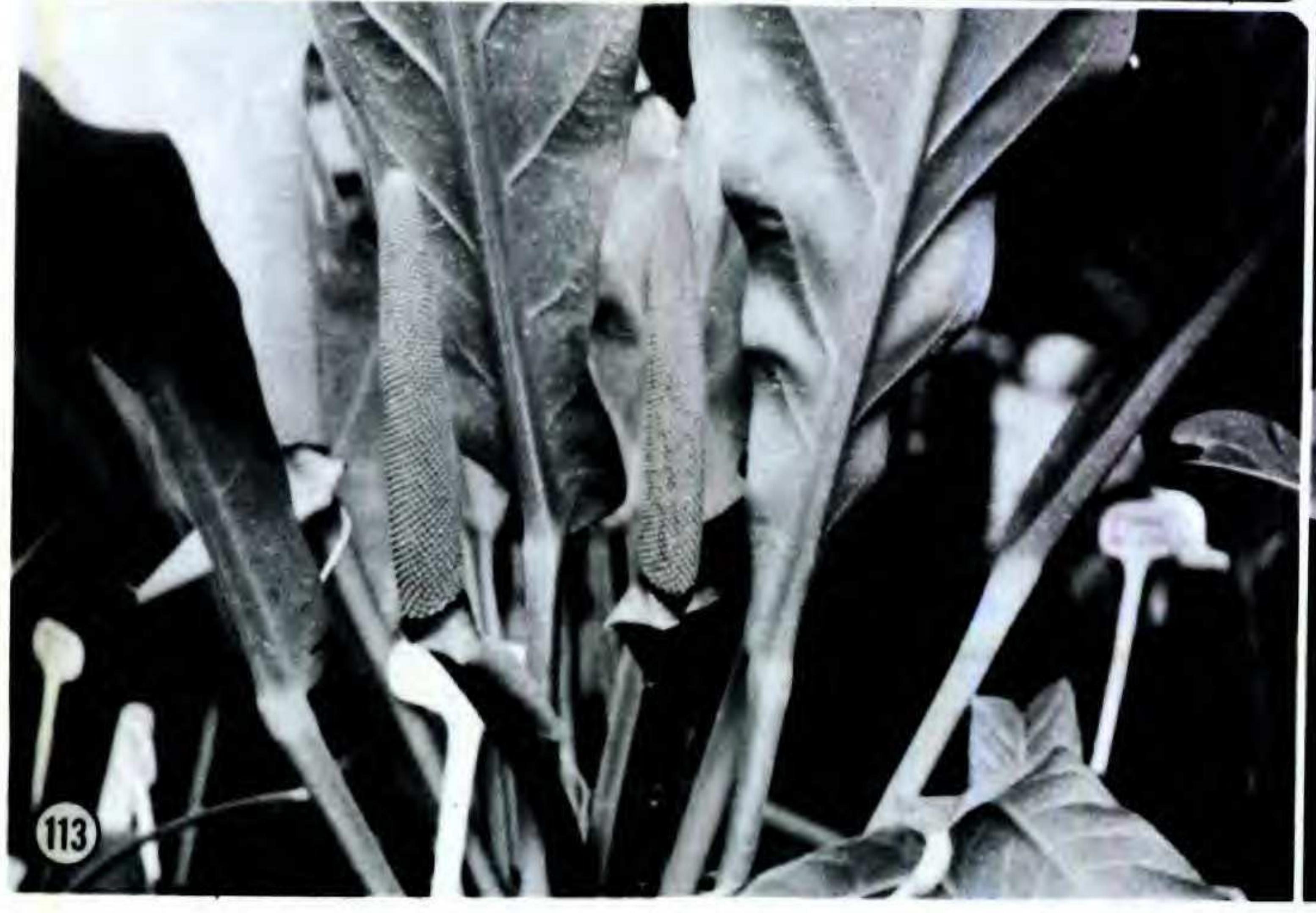


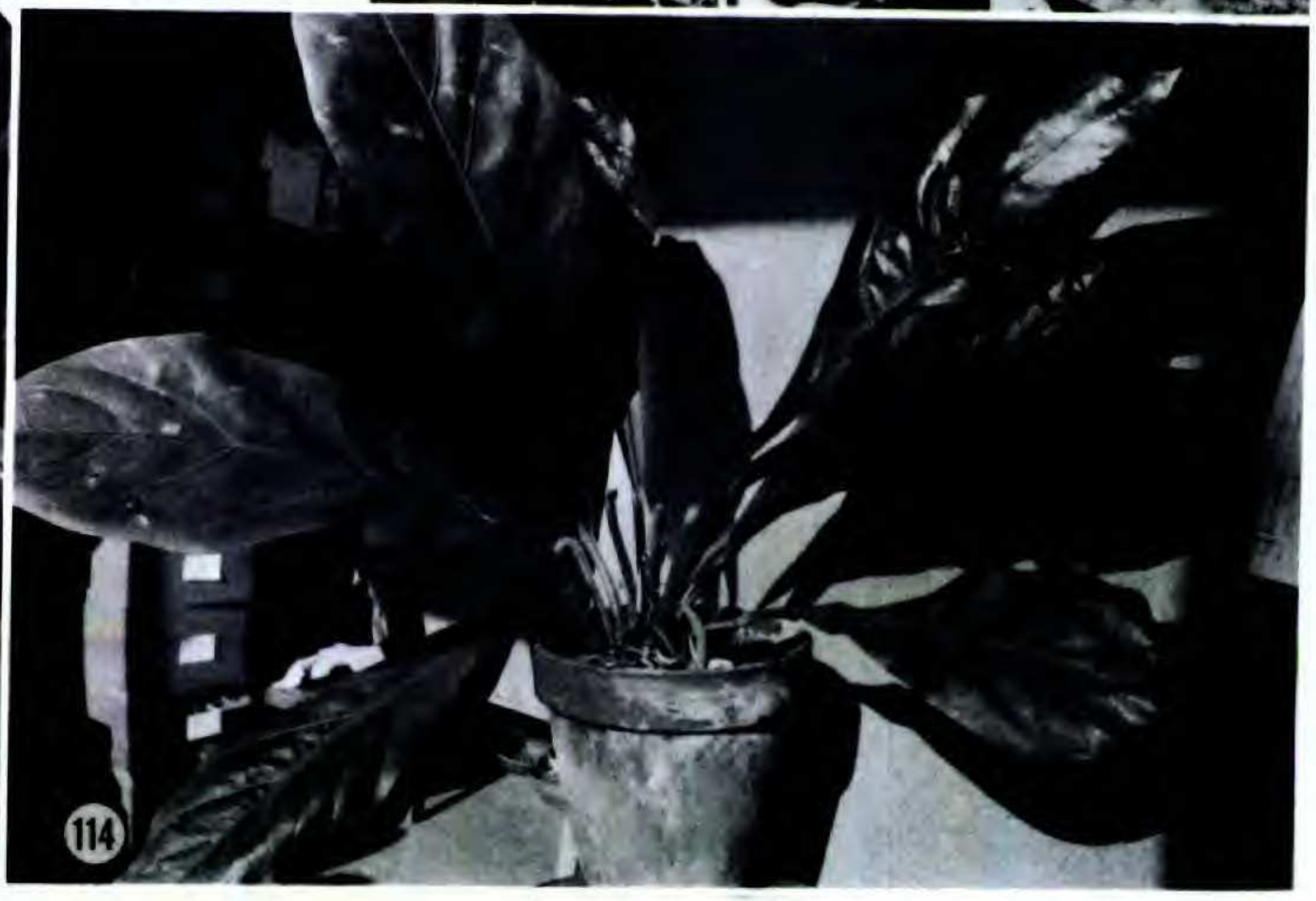




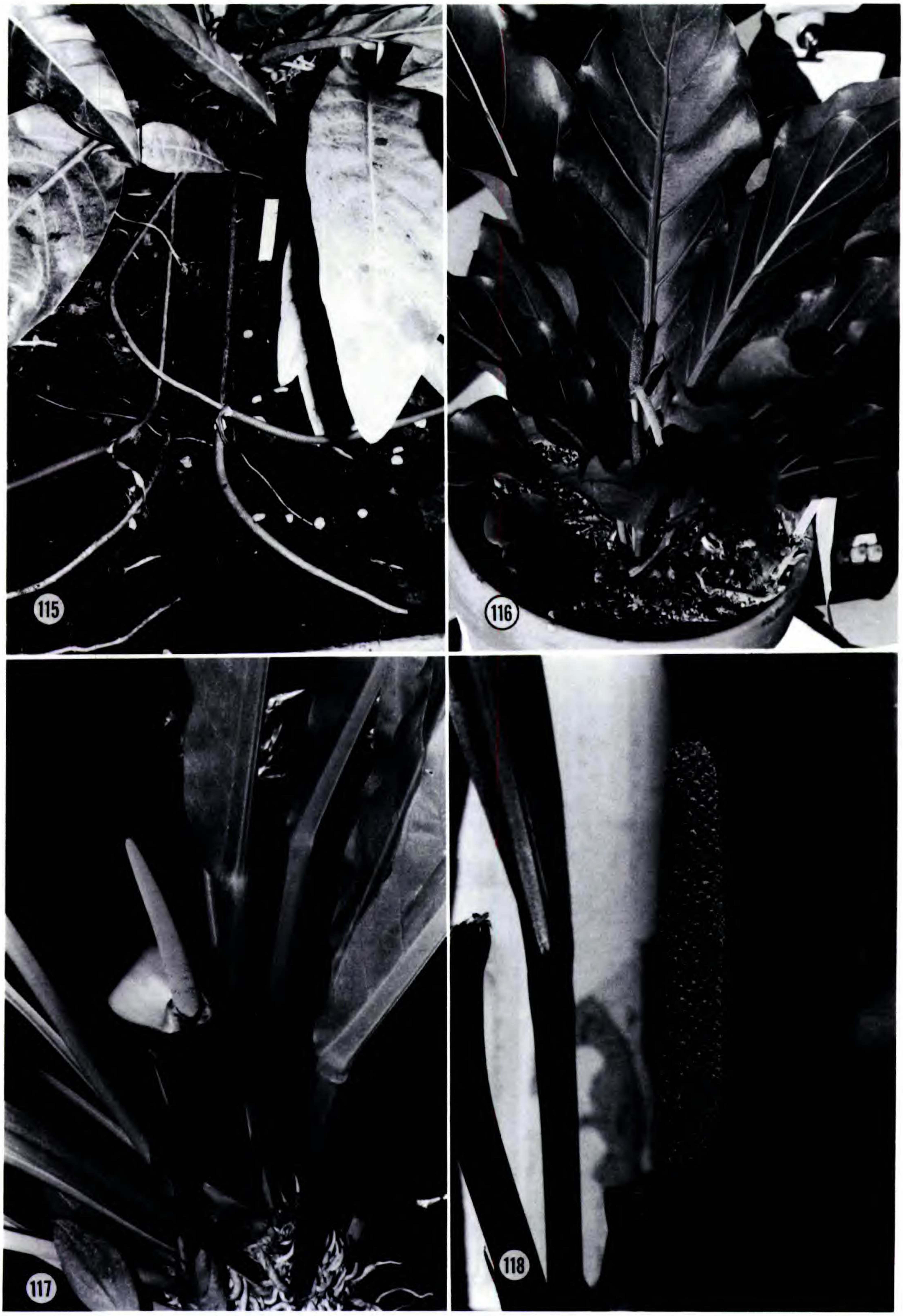
FIGURES 107–110.—107. *Anthurium cotobrusii* Croat & R. A. Baker, *Croat 67983*.—108. *A. cotobrusii* Croat & R. A. Baker, *Croat 33058*.—109. *A. crassinervium* (Jacq.) Schott, Venezuela: Jardin Botánico de Caracas (not collected).—110. *A. crassinervium* (Jacq.) Schott, *Croat 60621*.



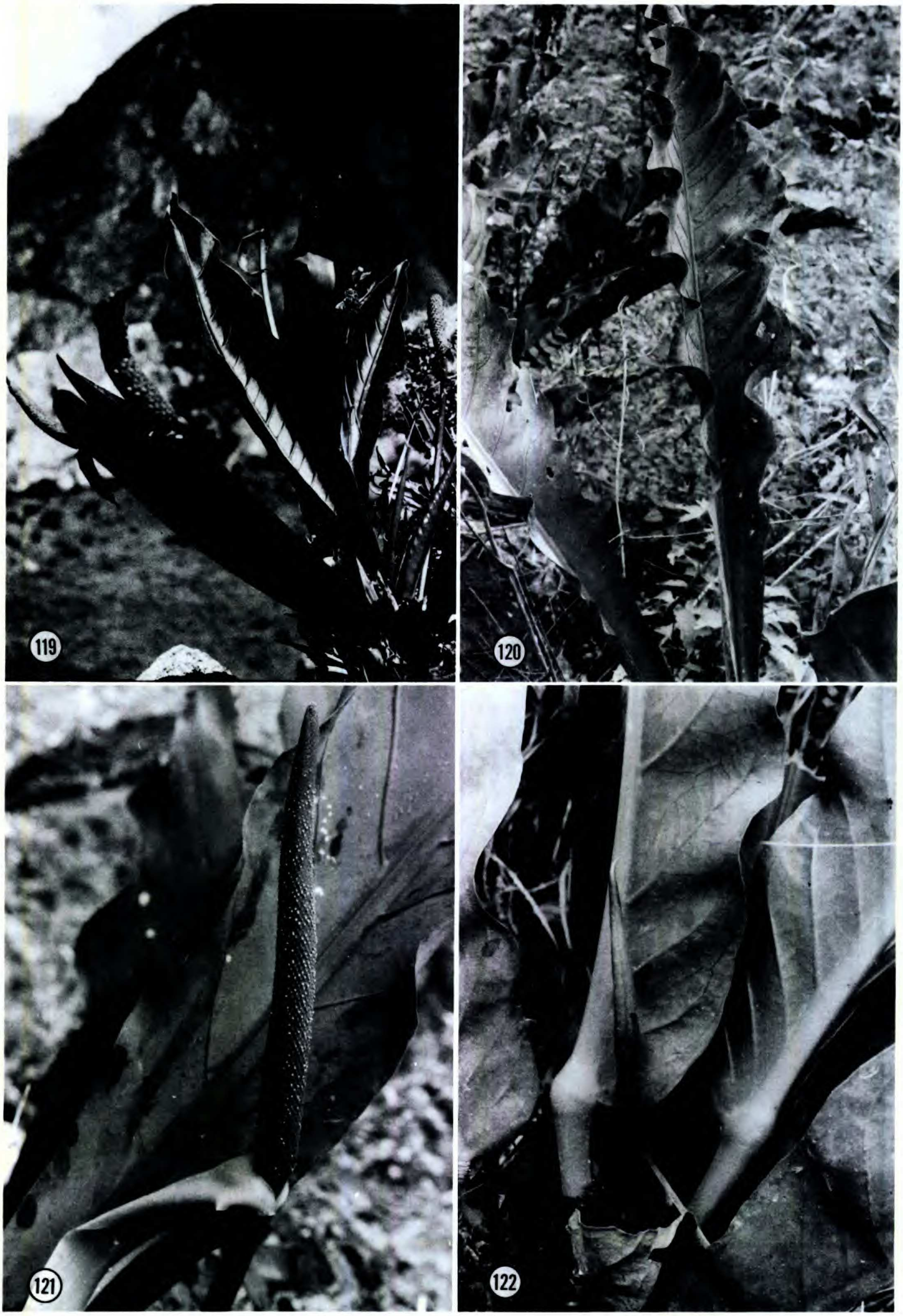




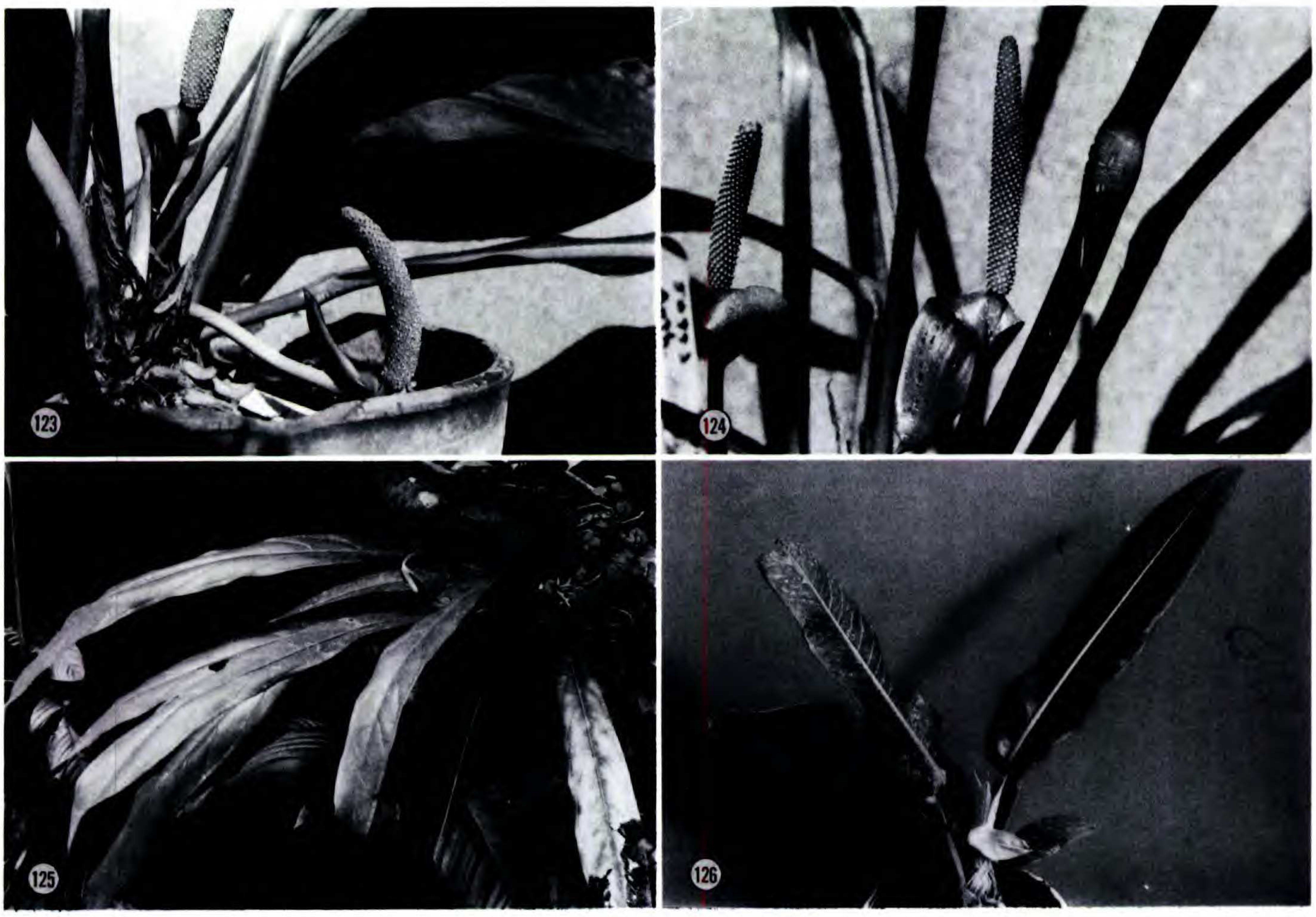
FIGURES 111–114.—111. *Anthurium crenatum* (L.) Kunth, cultivated at Kew.—112. *A. cubense* Engl., Venezuela: Zulia (photo: Bunting).—113. *A. cubense* Engl., *Neill 2730*.—114. *A. curtispadix* Croat, *Croat 55207*.



FIGURES 115-118.—115. *Anthurium crenatum* (L.) Kunth, cultivated at Kew.—116, 117. *A. cubense* Engl., *Neill 2730.*—118. *A. curtispadix* Croat, *Croat 55207.*



FIGURES 119–122.—119. *Anthurium dombeyanum* Brongn. ex Schott, Peru: Machupicchu (photo by T. Plowman).—120, 121. *A. dombeyanum* Brongn. ex Schott, *Croat 58366.*—122. *A. dombeyanum* Brongn. ex Schott, *Croat 50847.*



FIGURES 123–126.—123. *Anthurium curtispadix* Croat, *Croat 55207.*—124. *A. ernestii* Engl. var. *ernestii, Croat 50993.*—125. *A. eximium* Engl., *Croat 67622.*—126. *A. fasciale* Sodiro, cultivated at Munich Bot. Gard. (*#83/2905*; photo: Bogner).

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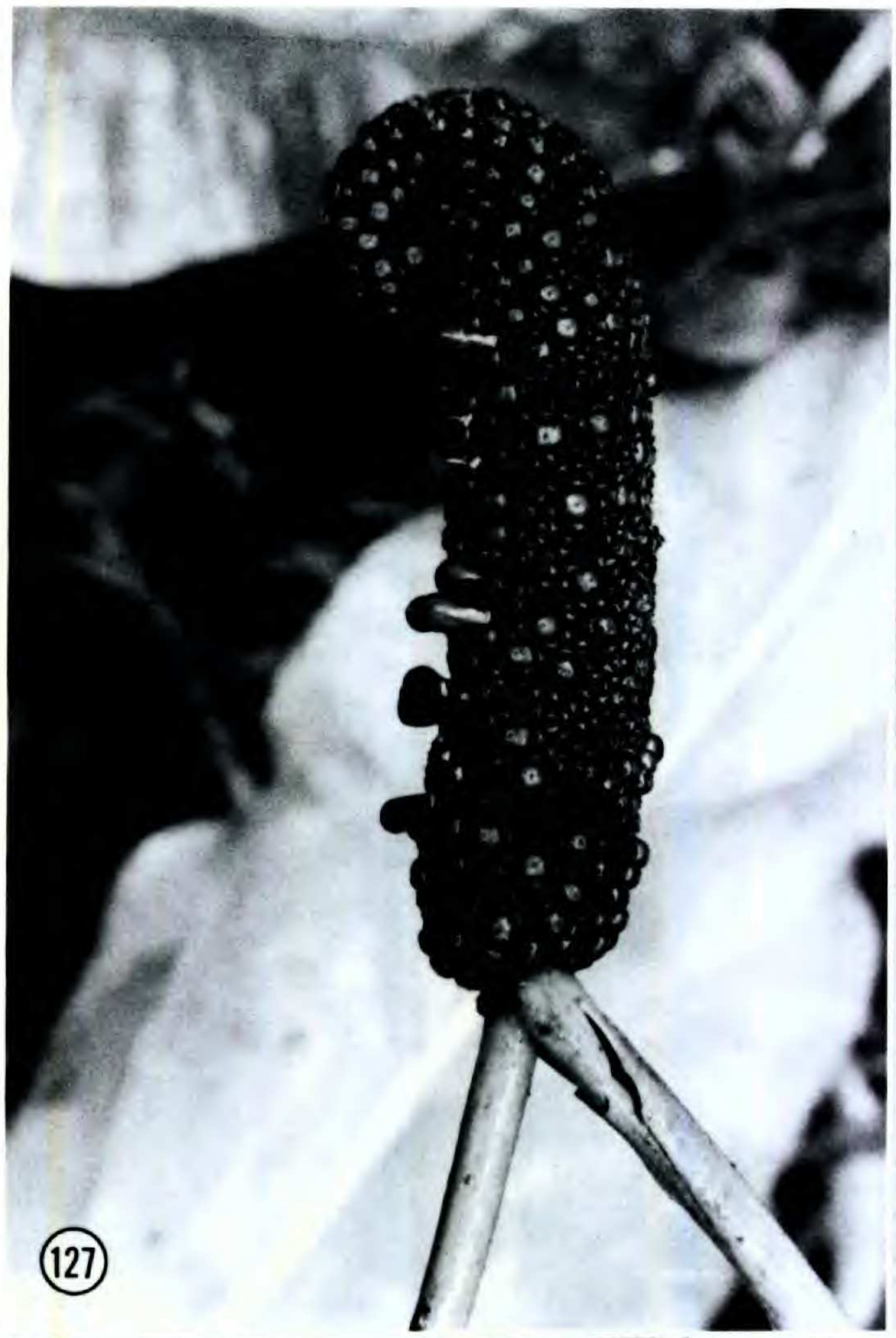
FIGURES 127–130.—127. *Anthurium dombeyanum* Brongn. ex Schott, *Croat 58324.*—128. *A. ernestii* Engl. var. *ernestii, Croat 50994.*—129. *A. ernestii* Engl. var. *ernestii, Croat 50993.*—130. *A. ernestii* Engl. var. *ernestii, Croat 58591.*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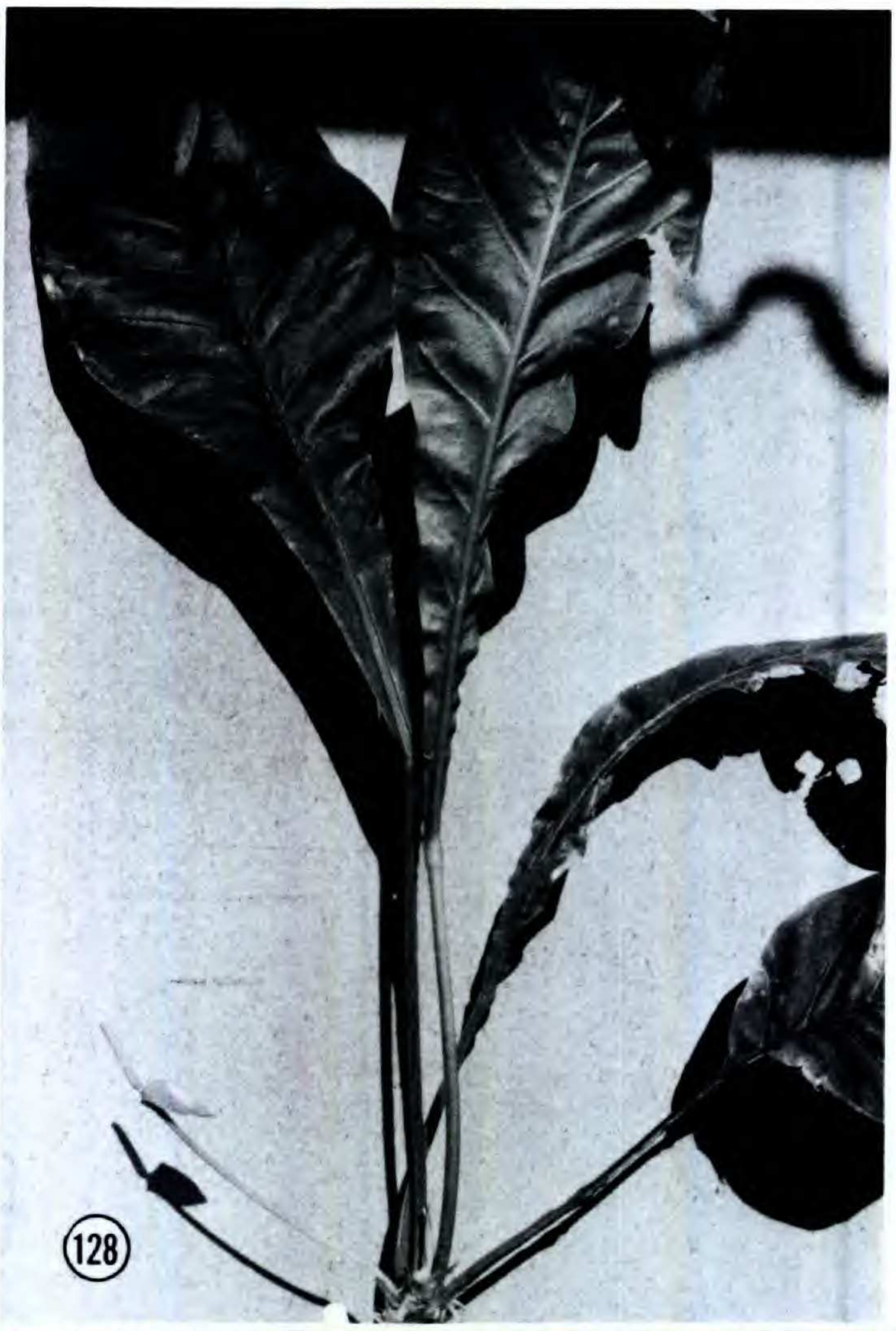
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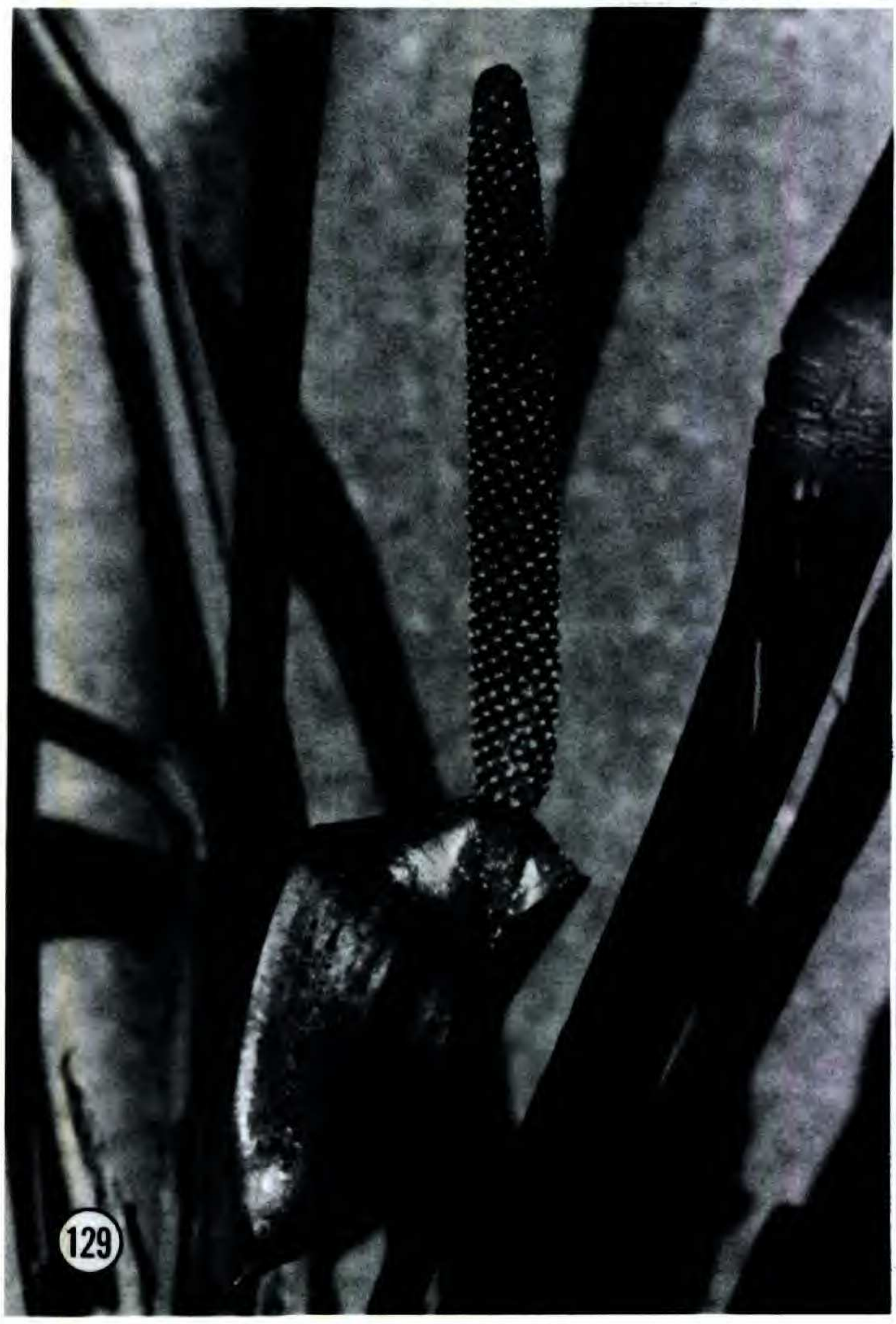
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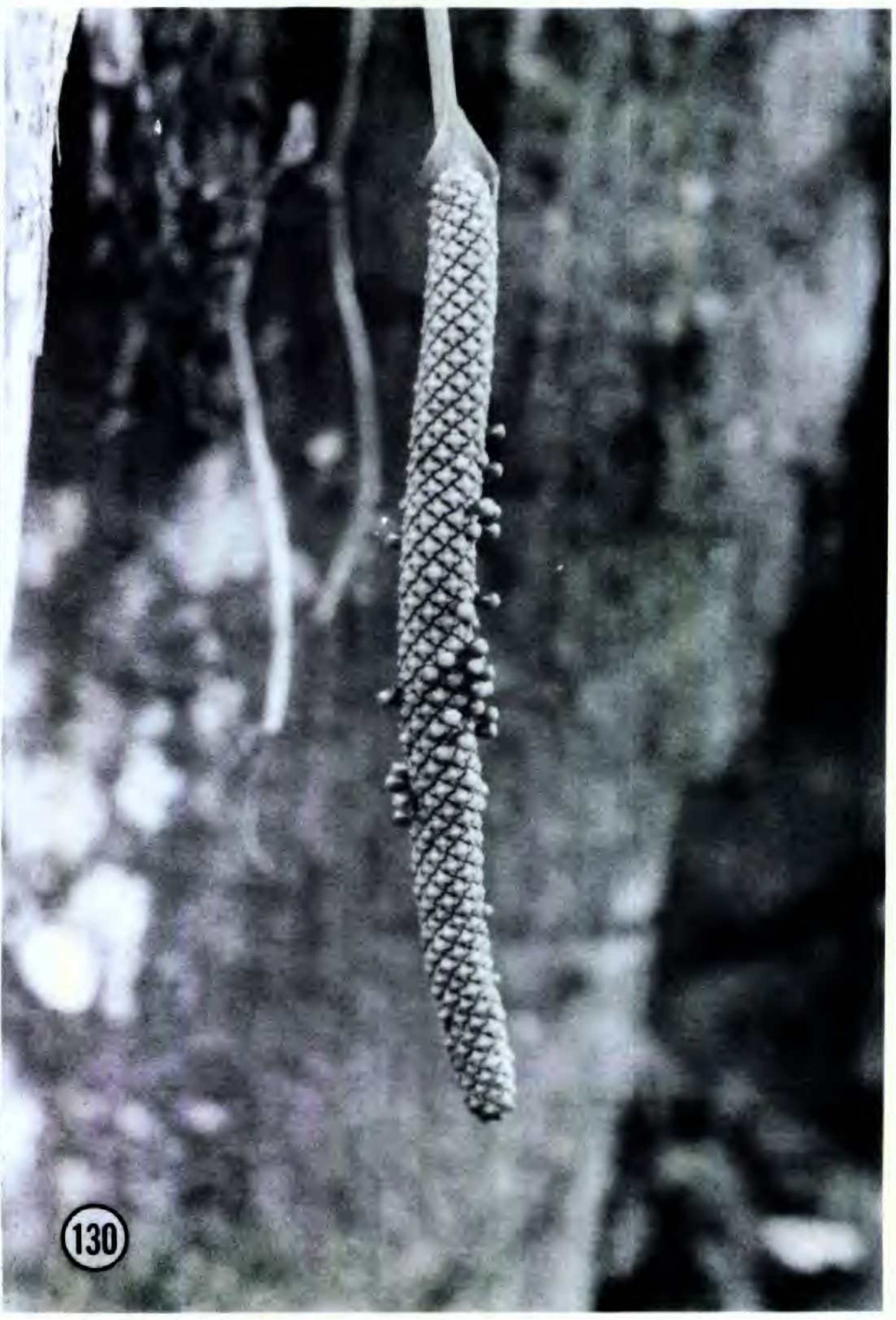
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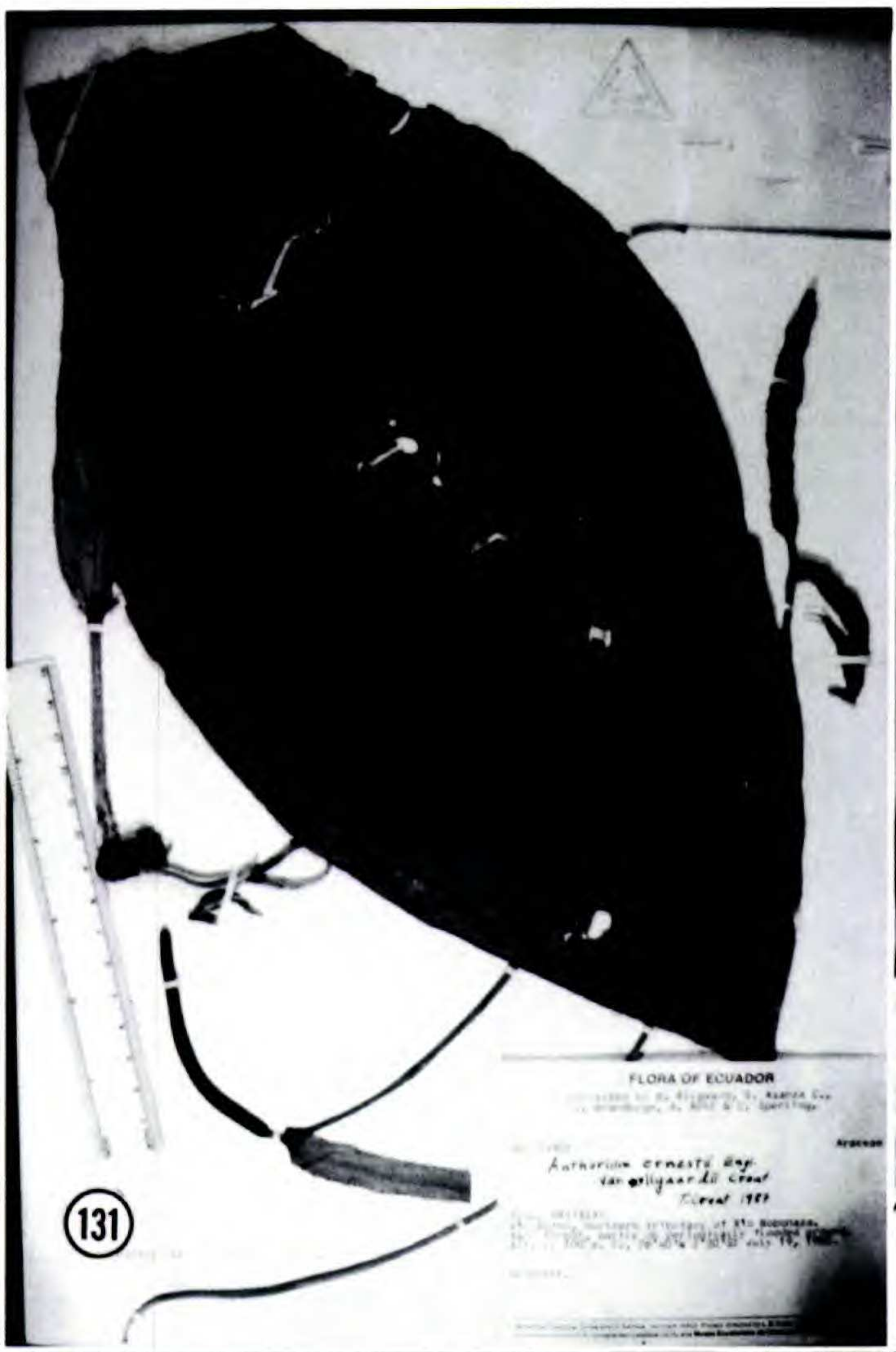
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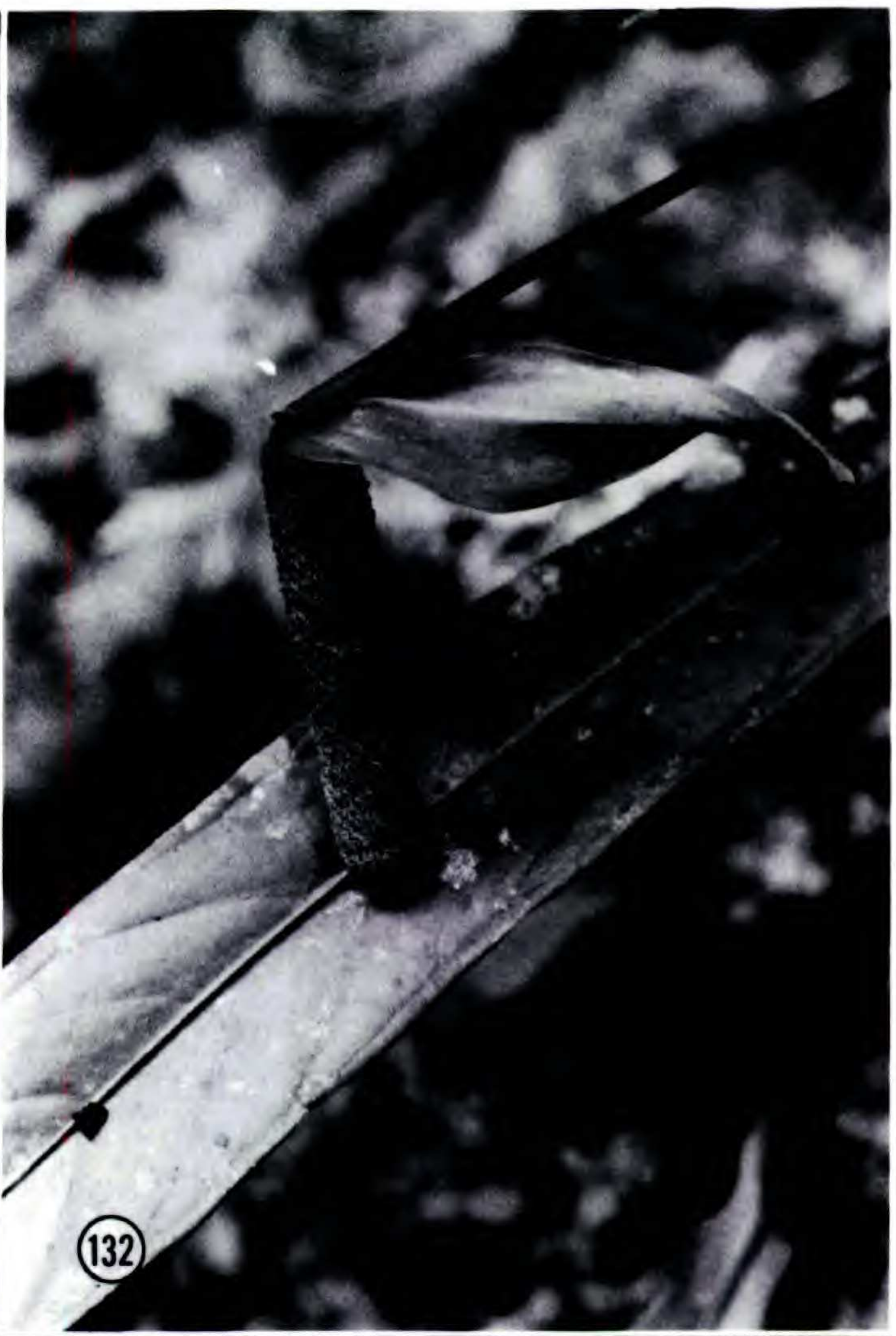

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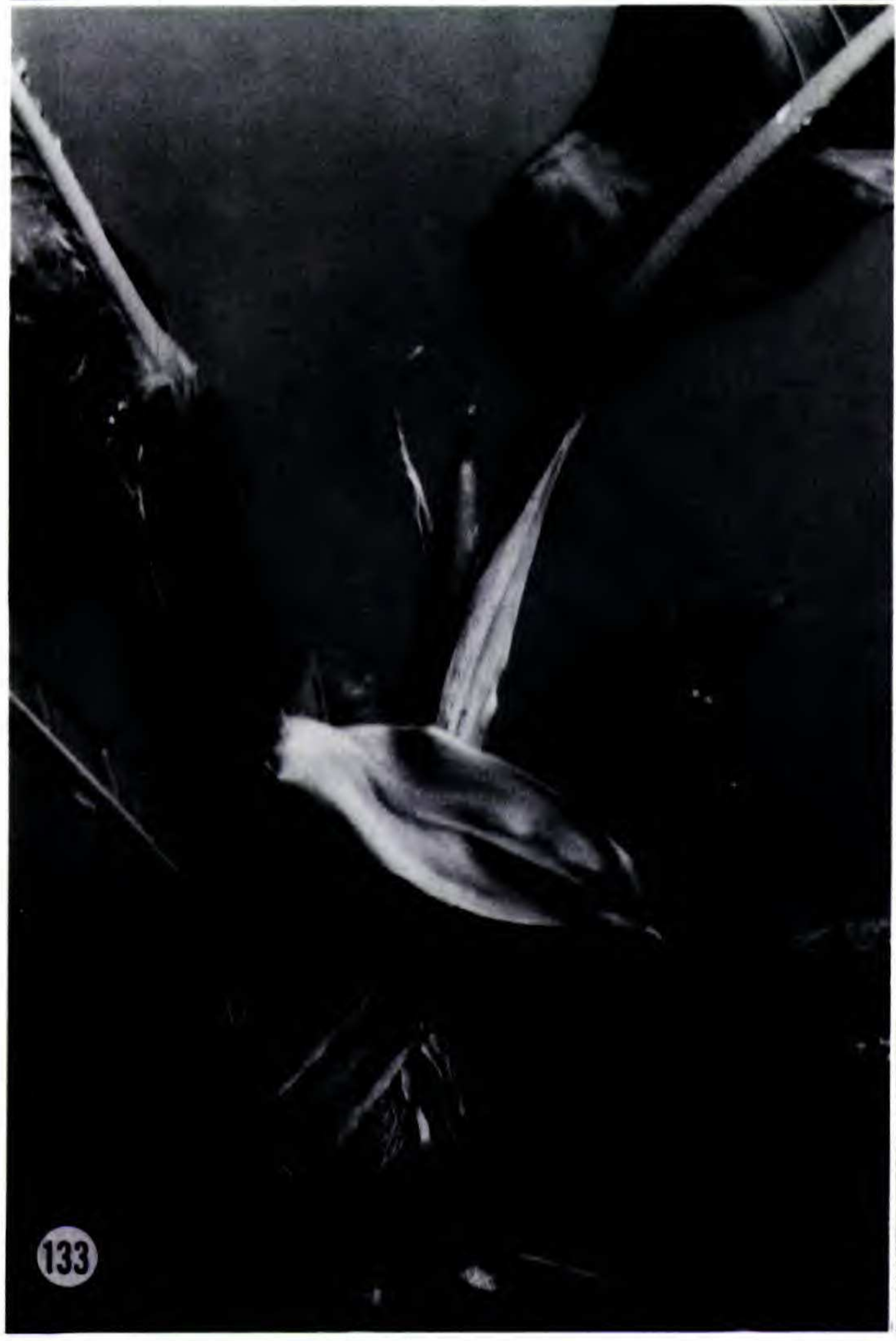

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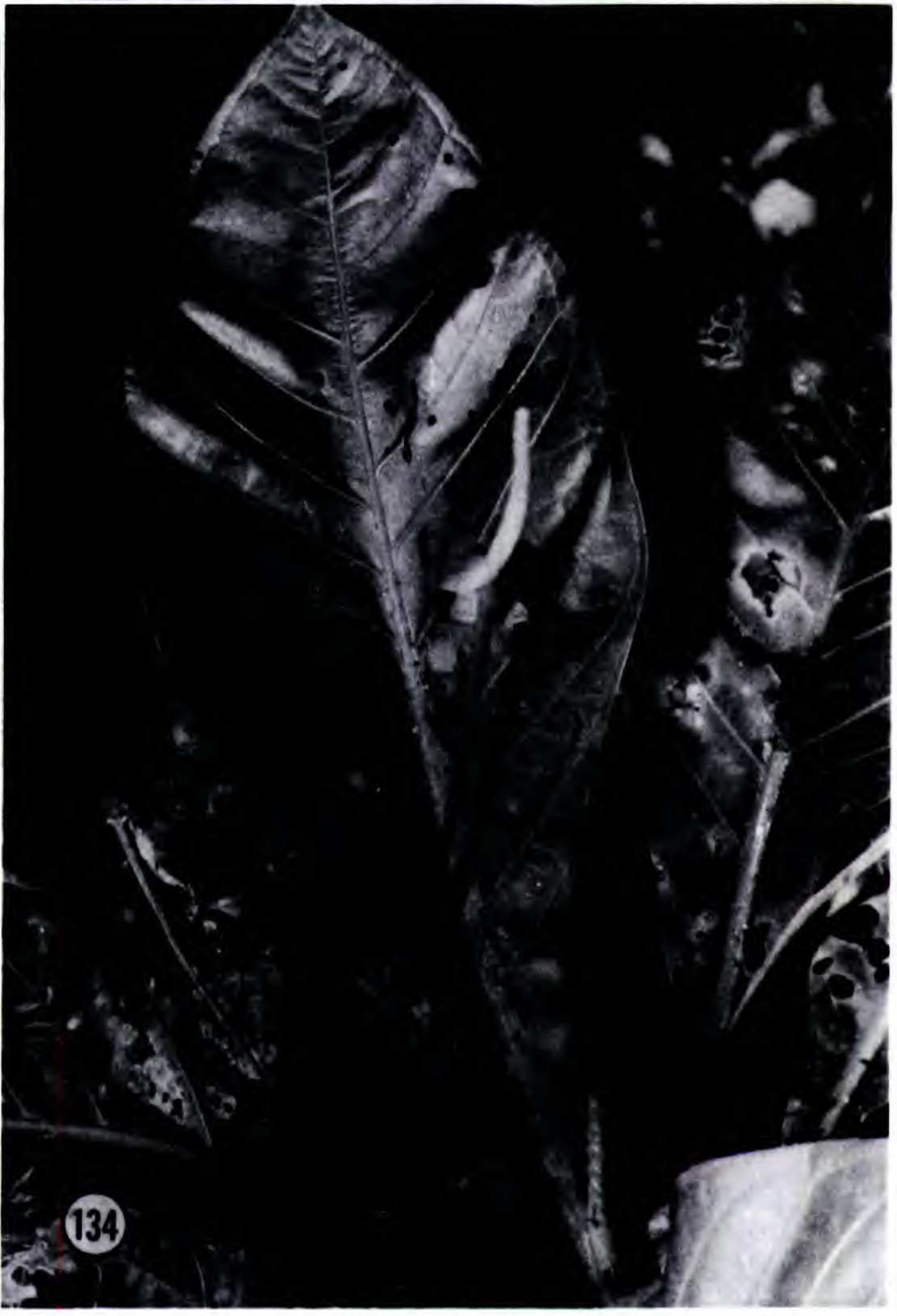

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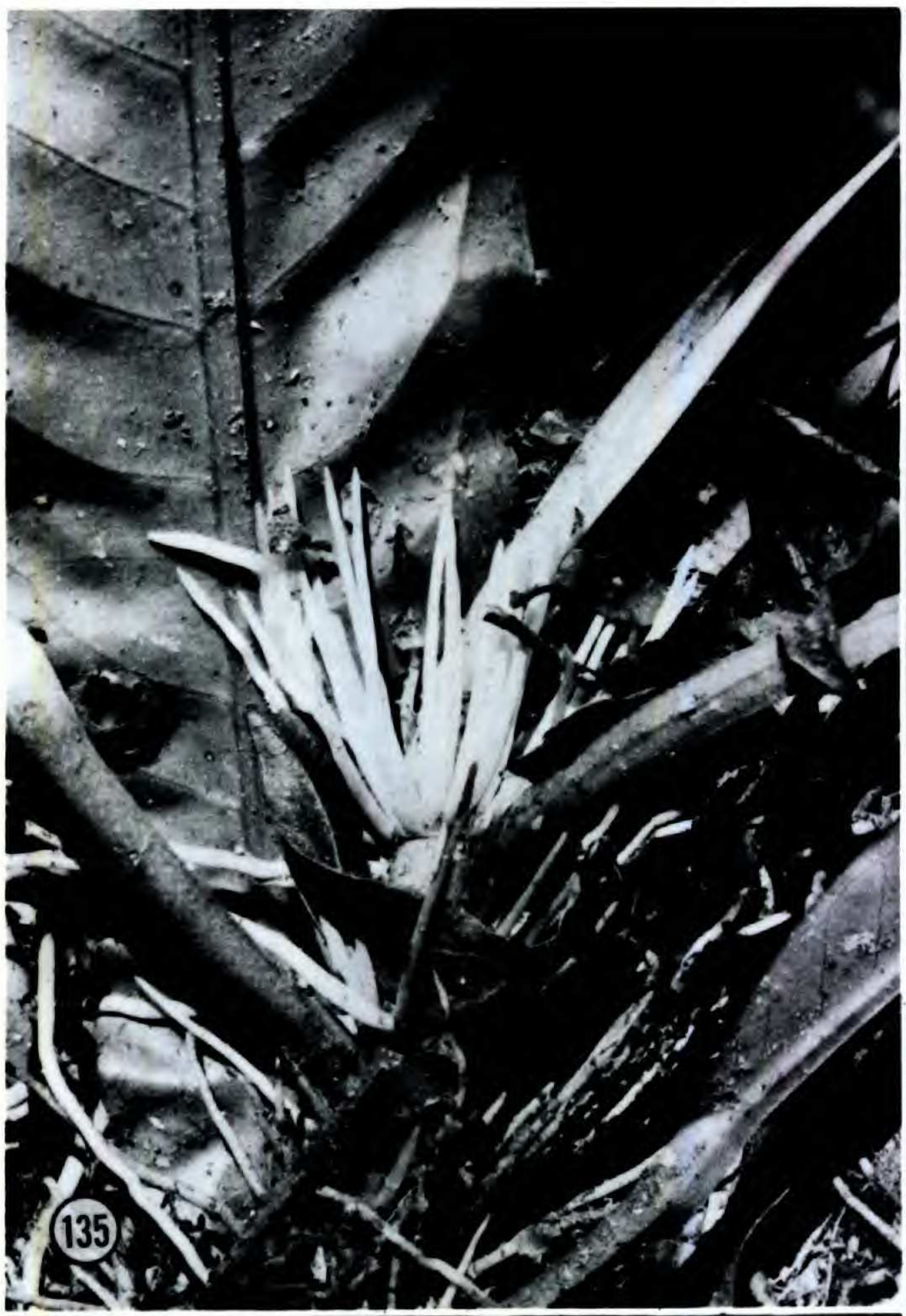
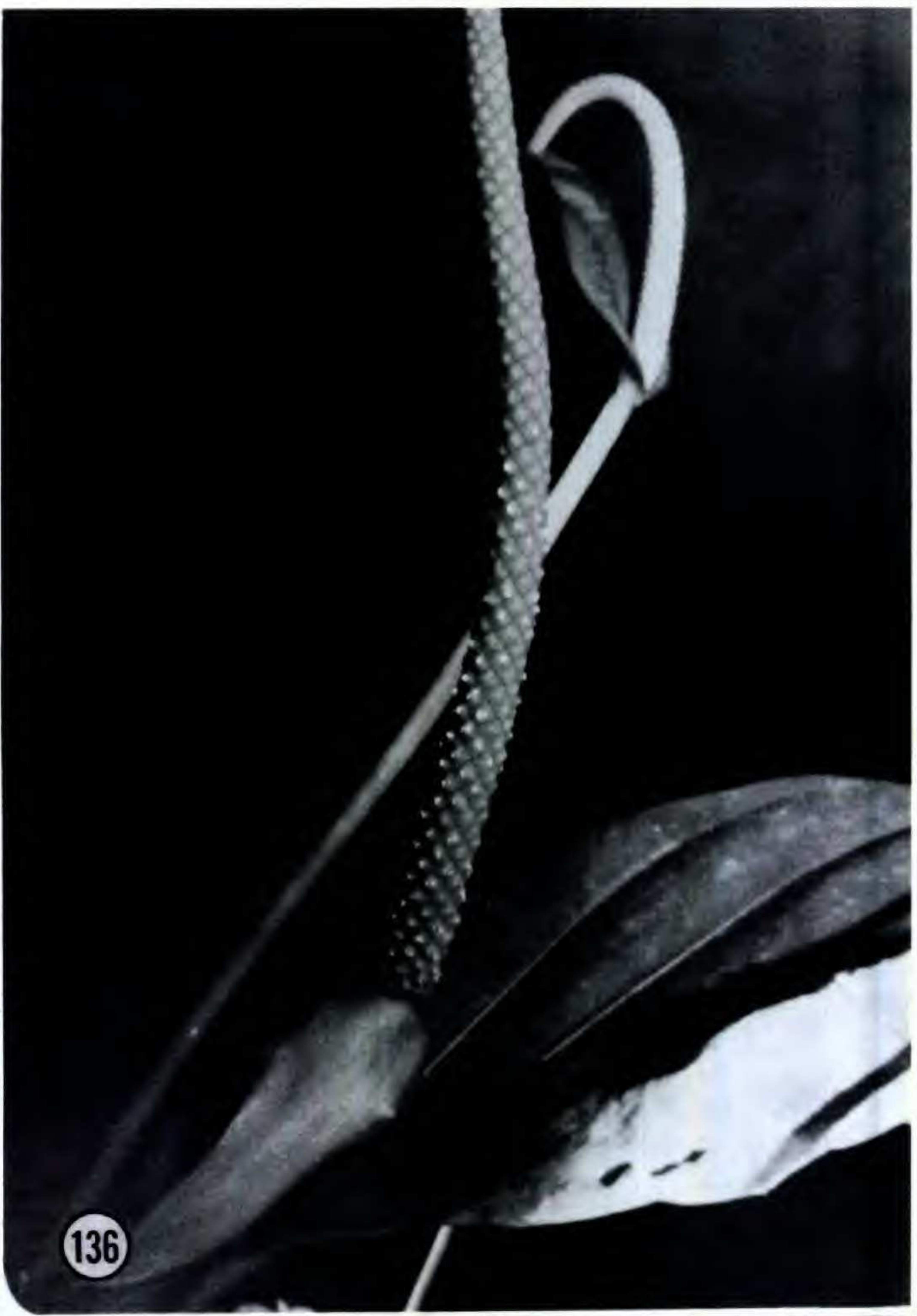
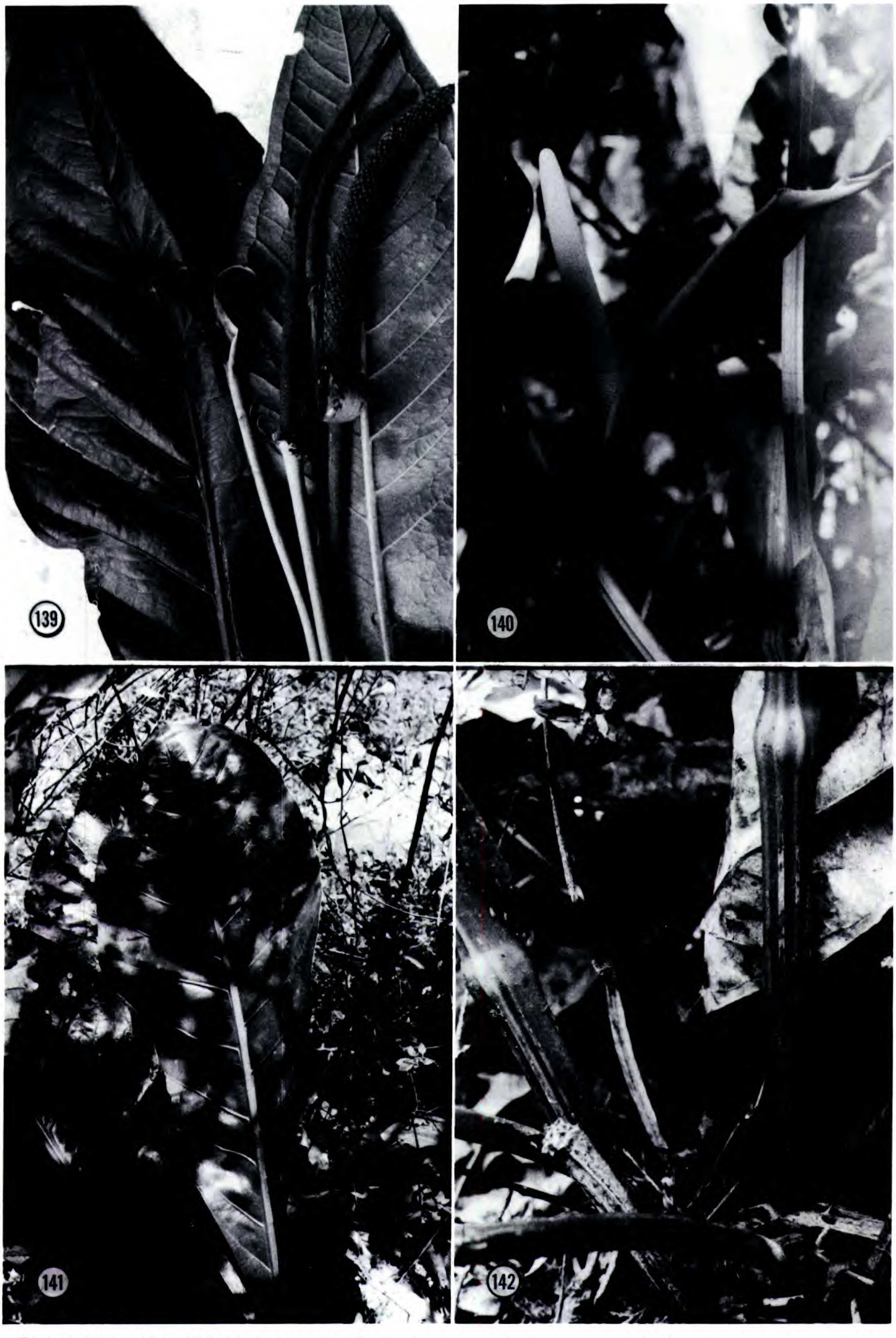
FIGURES 131–134.—131. *Anthurium ernestii* Engl. var. *oellgaardii* Croat, *Oellgaard et al. 34801.*—132. *A. eximium* Engl., *Croat 57240.*—133. *A. fasciale* Sodiro, cultivated at Munich Bot. Gard. (*#83/2905*; photo: Bogner).—134. *A. fatoense* K. Krause, *Croat 57229.*

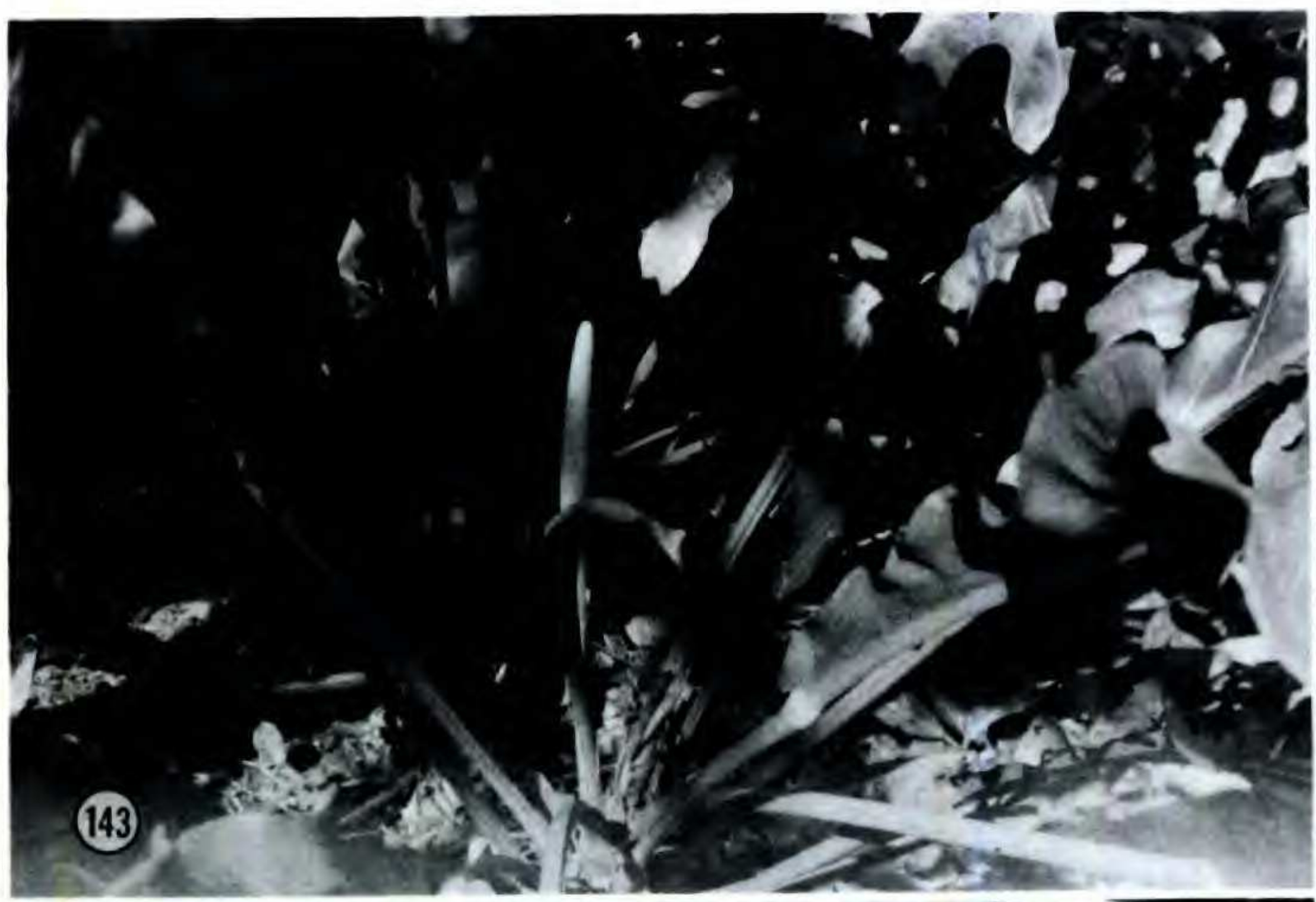


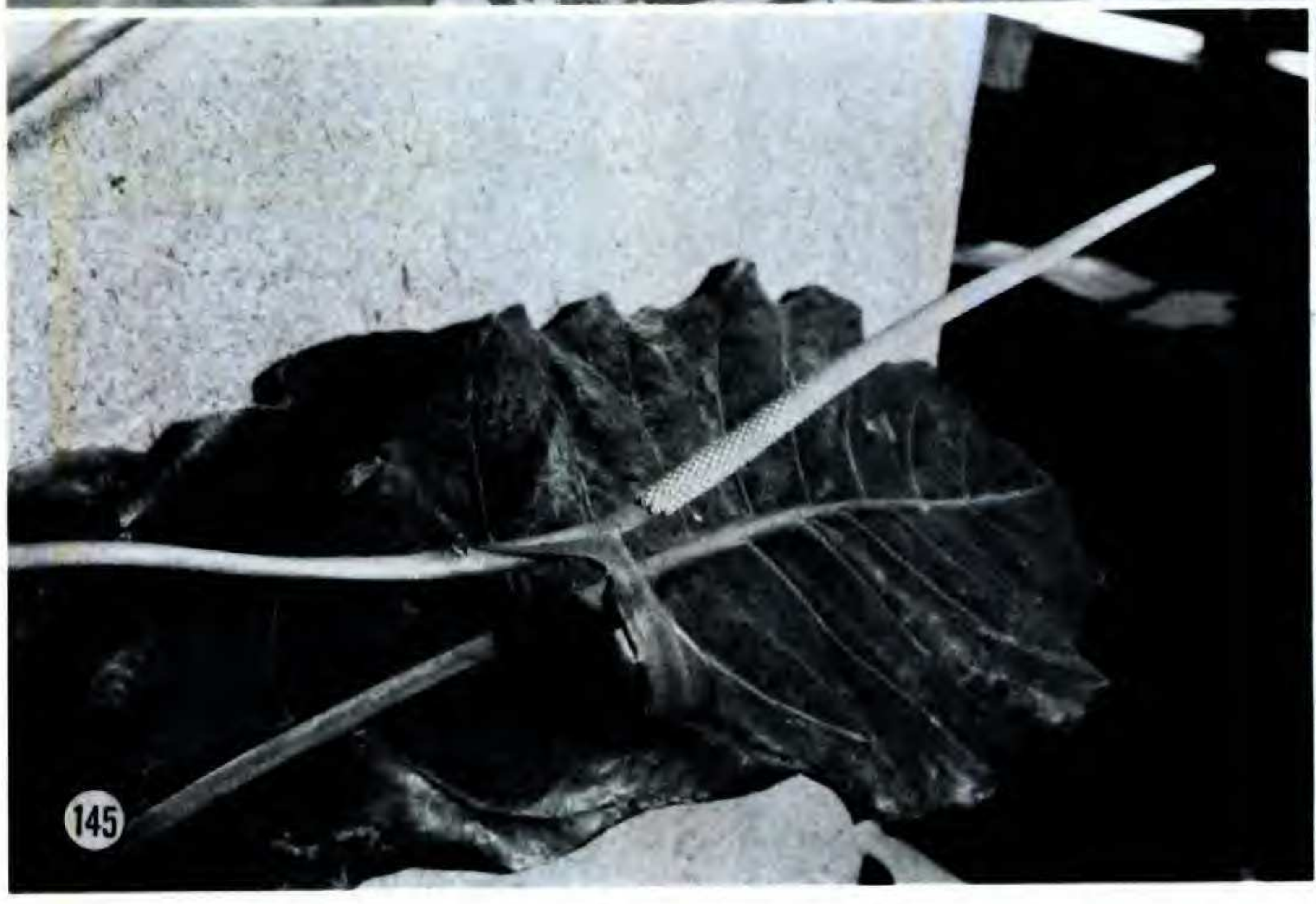


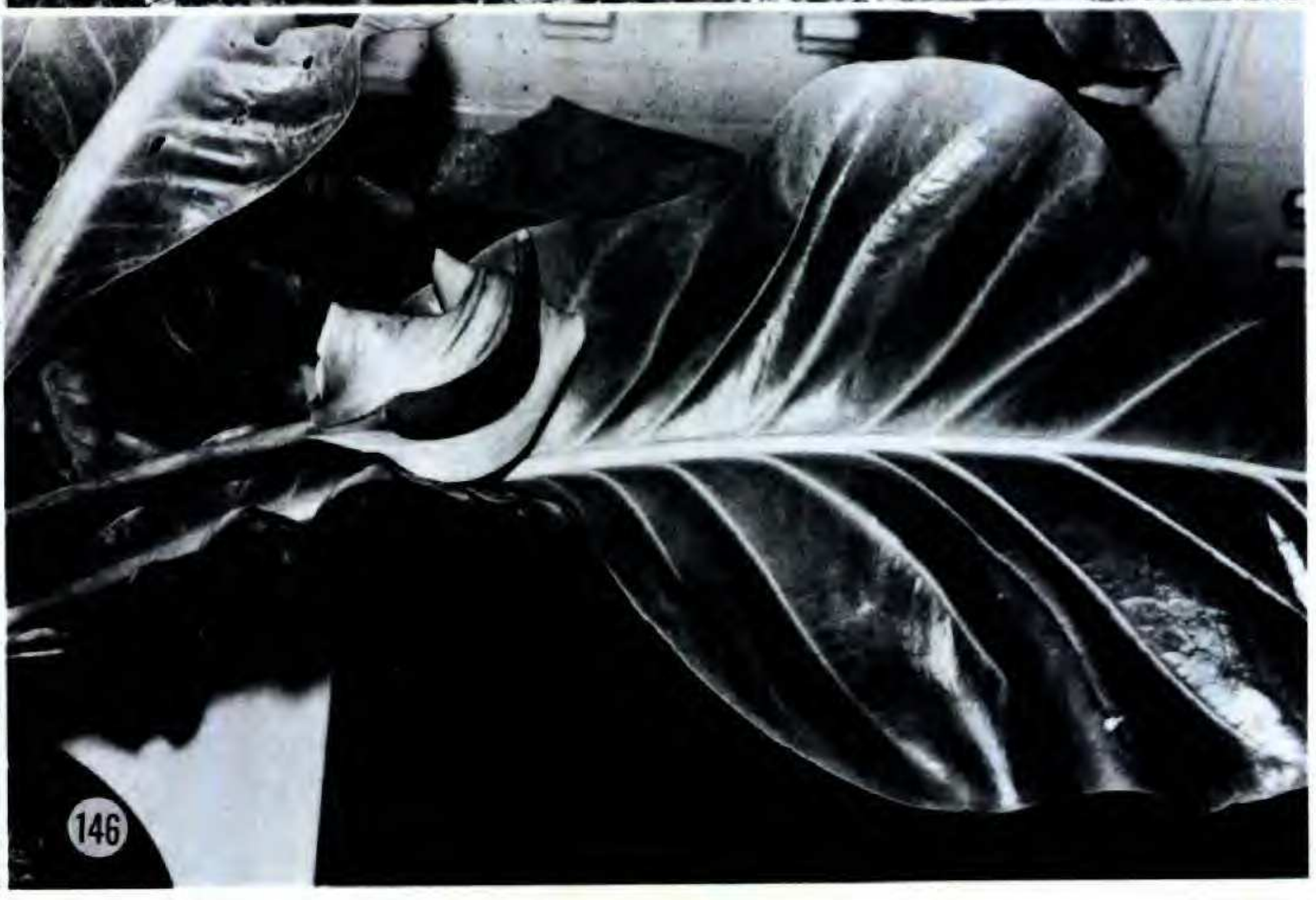
FIGURES 135–138.—135. *A. fatoense* K. Krause, *Croat 49893*.—136. *A. fatoense* K. Krause, *Folsom 2949*.—137. *A. fendleri* Schott, *Croat 54612*.—138. *A. fendleri* Schott, cultivated by Bette Waterbury.



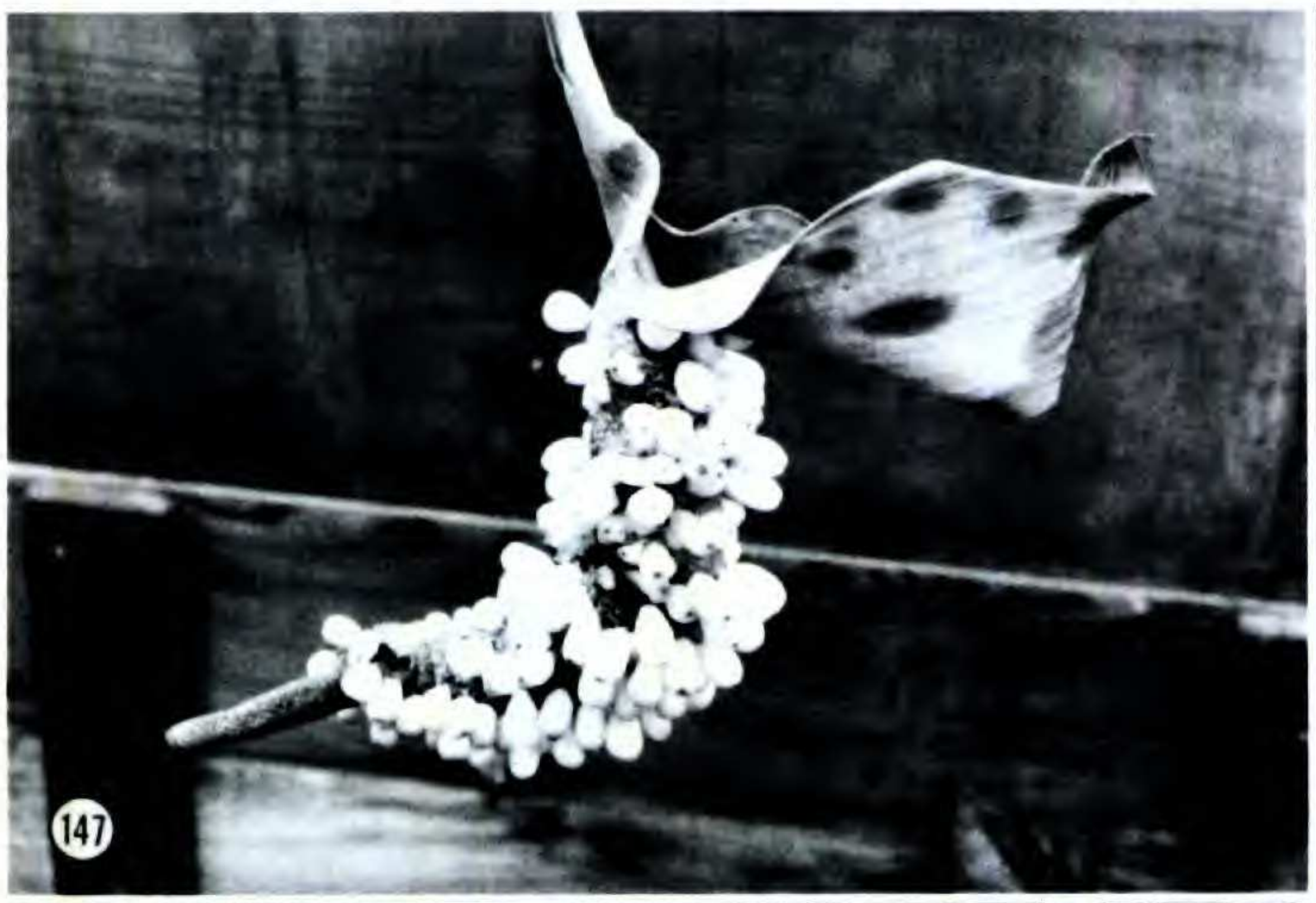
FIGURES 139–142.—139. *Anthurium fendleri* Schott, *Croat 56578.*—140. *A. galactospadix* Croat, cultivated by Burle-Marx.—141, 142. *A. glaucospadix* Croat, *Croat 56753.*

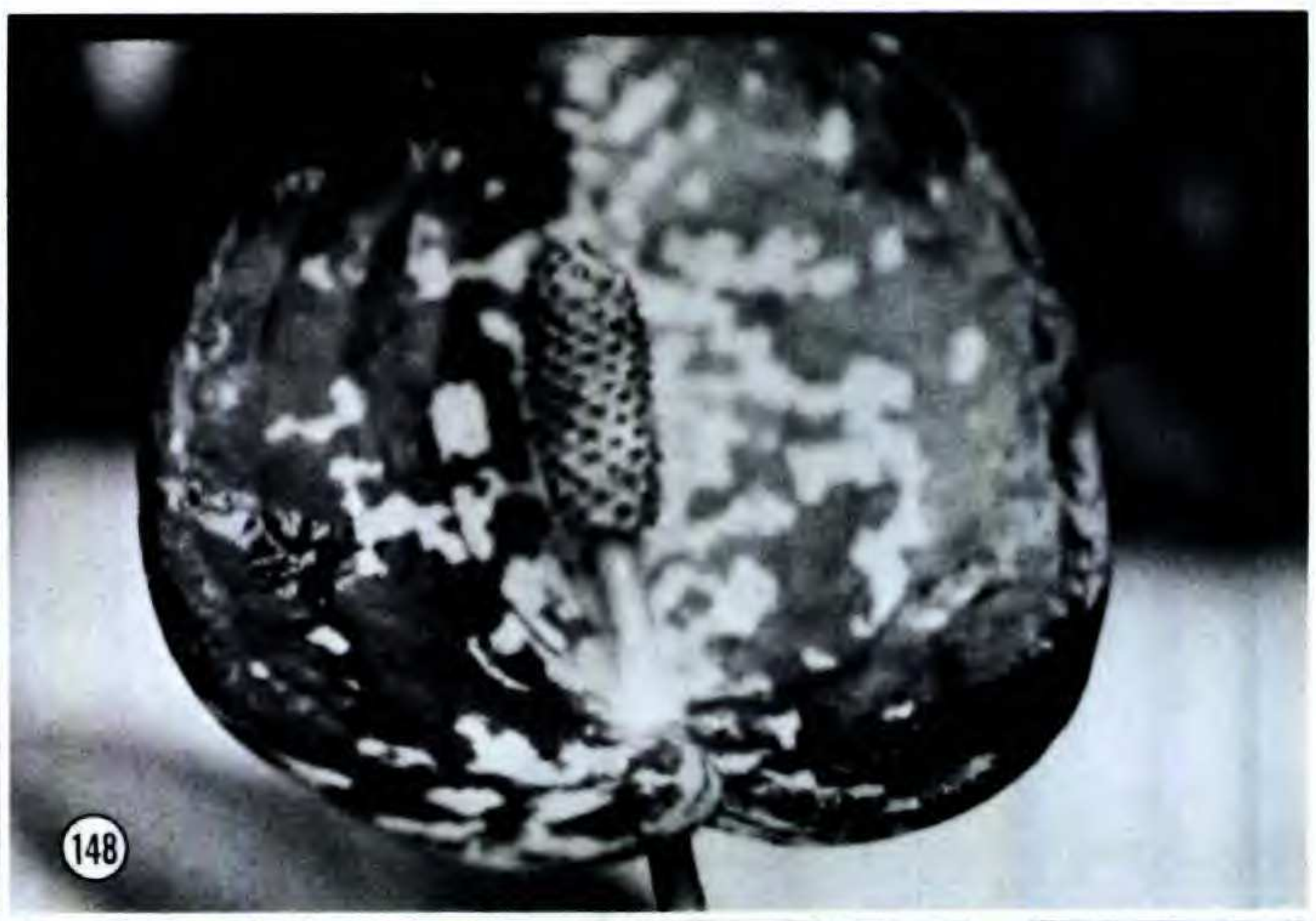


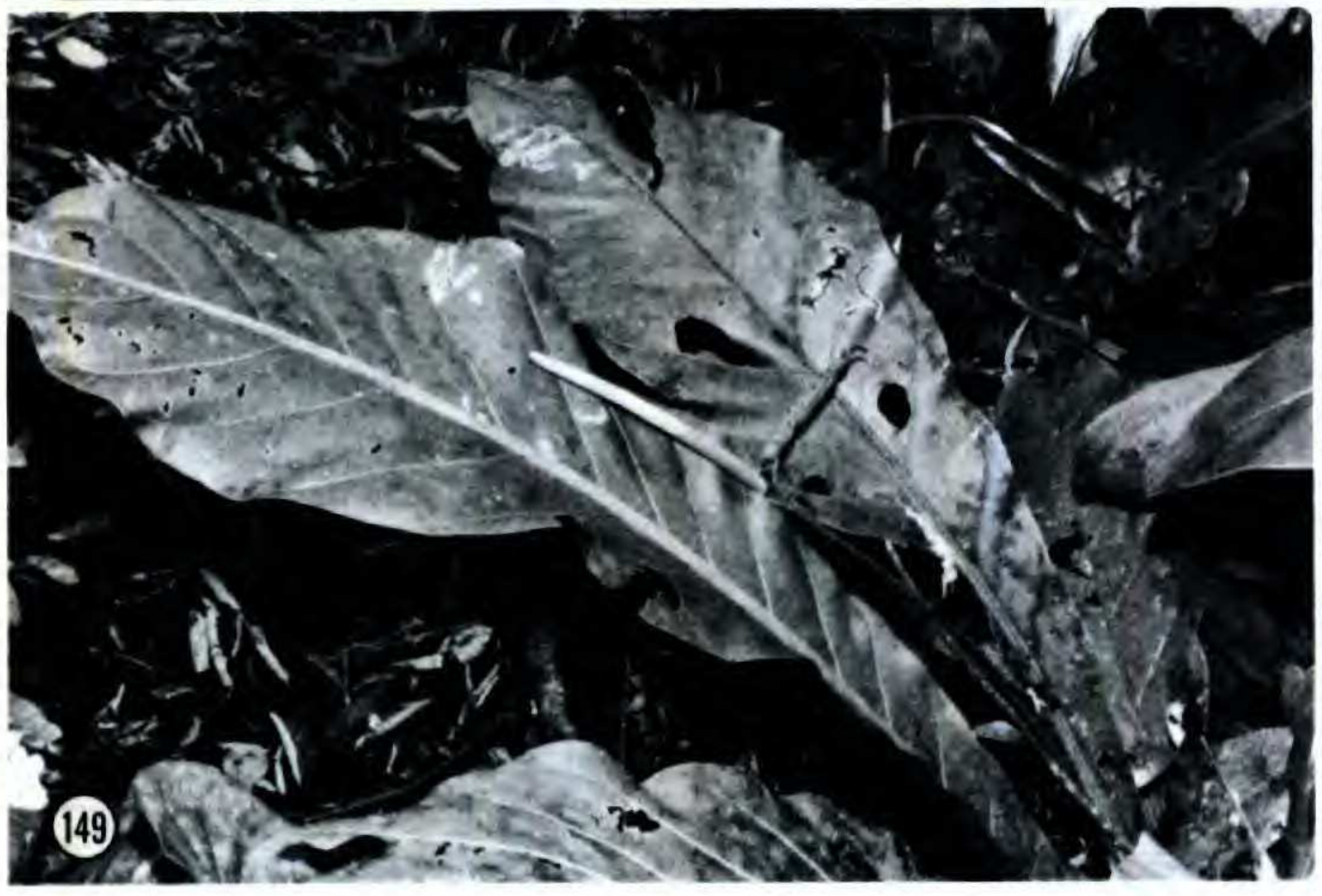


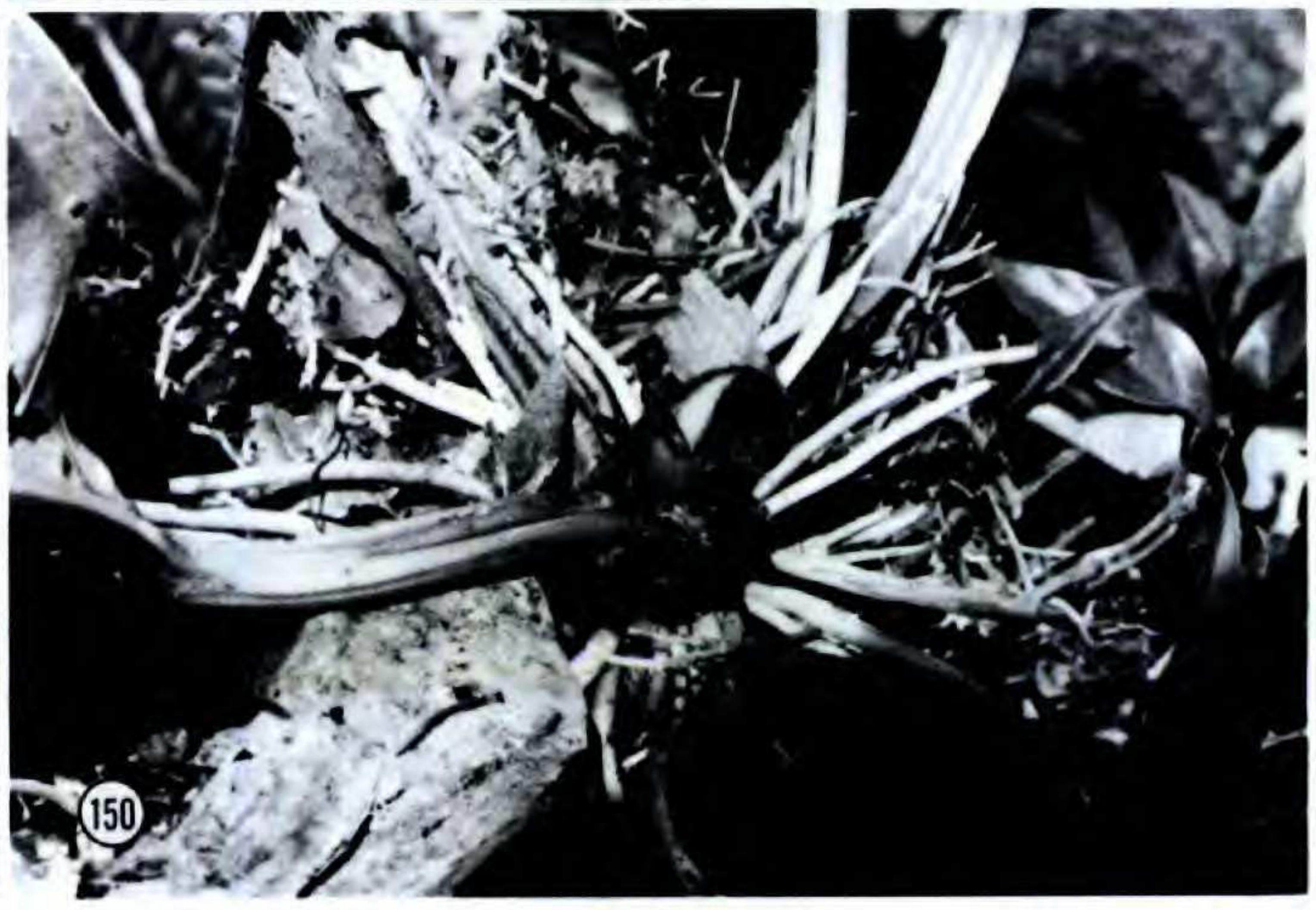


FIGURES 143–146.—143. *Anthurium galactospadix* Croat, cultivated by Burle-Marx.—144. *A. glaucospadix* Croat, *Croat 56753*.—145. *A. glaucospadix* Croat, *Croat 52000*.—146. *A. halmoorei* Croat, *Croat 45337*.

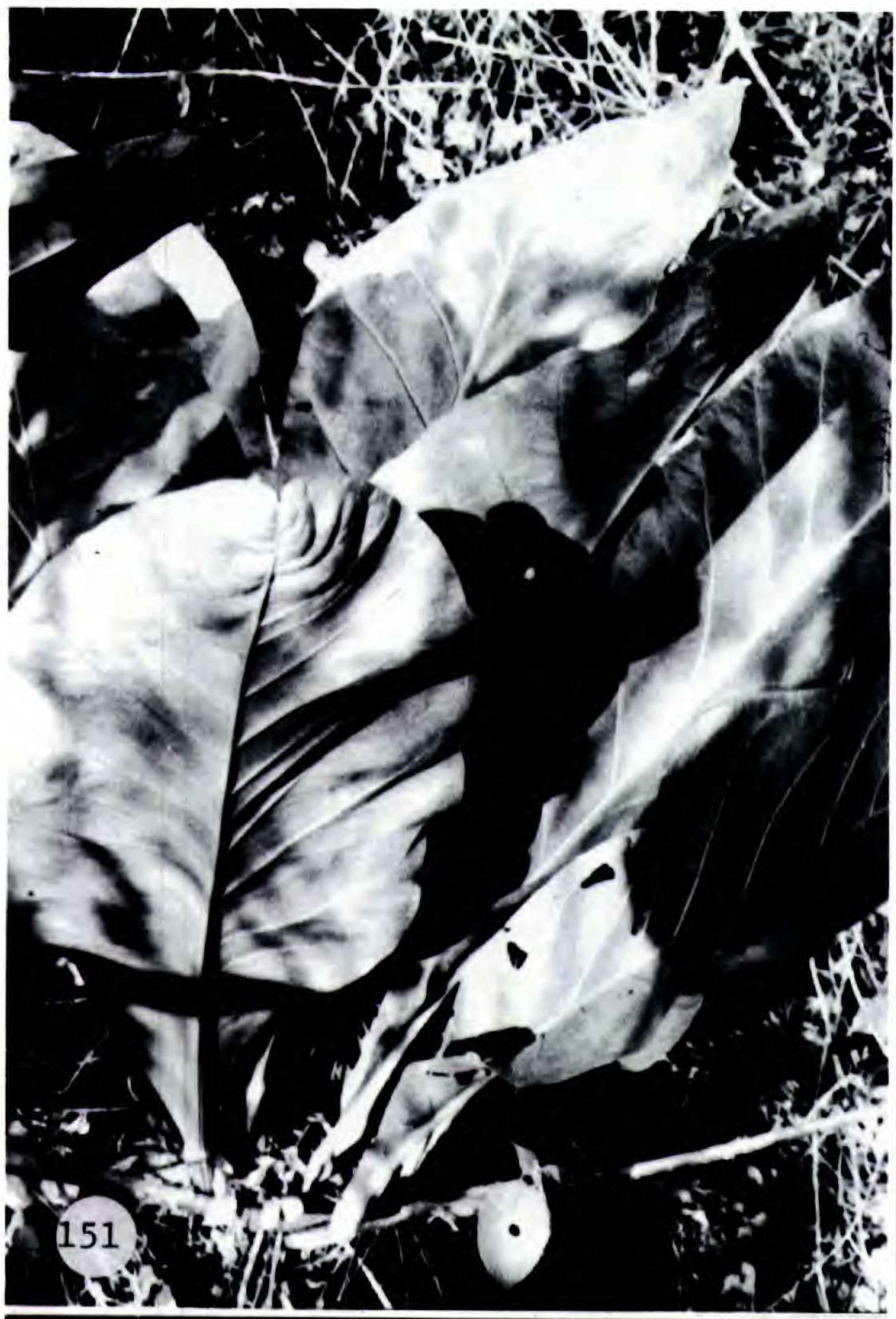


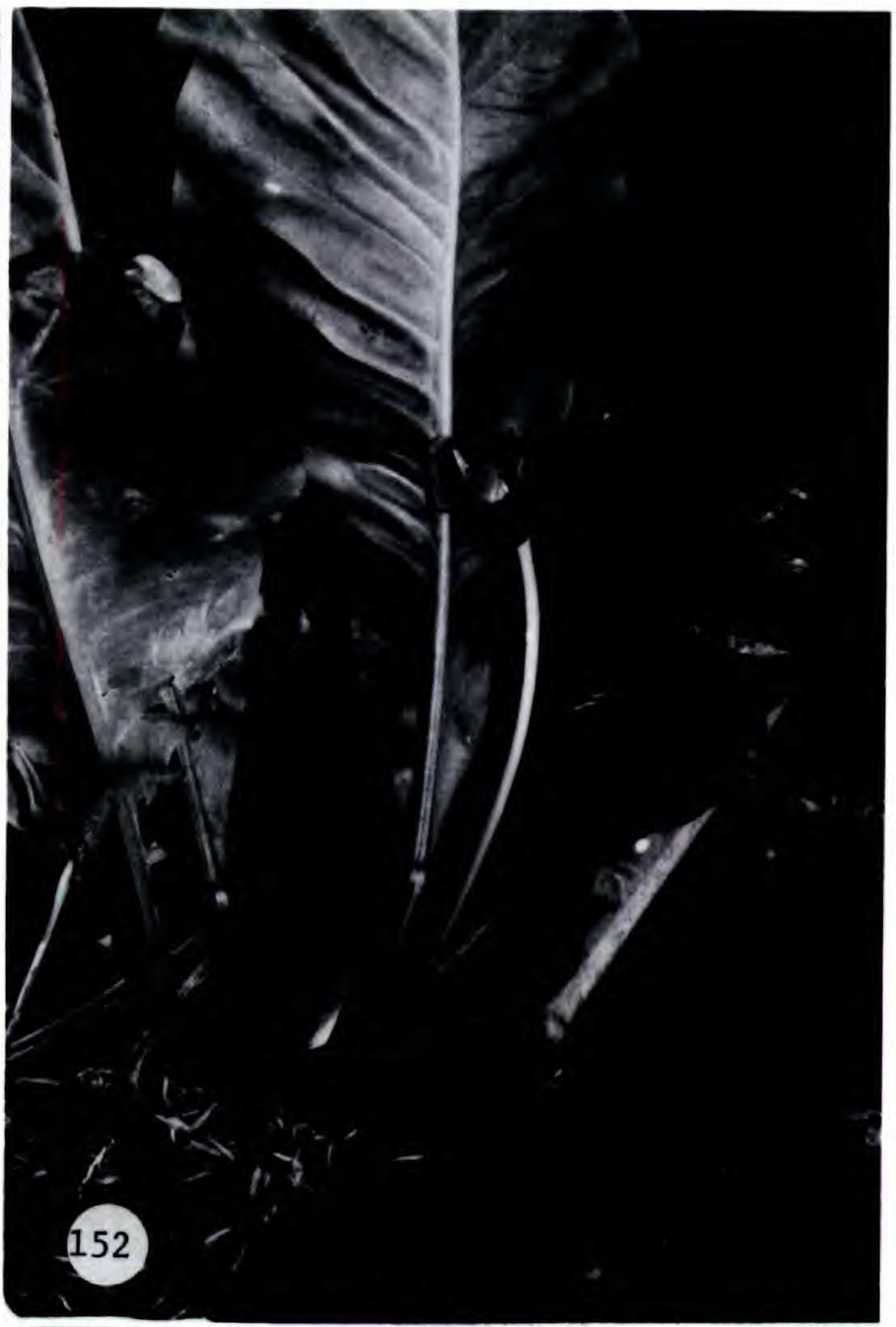


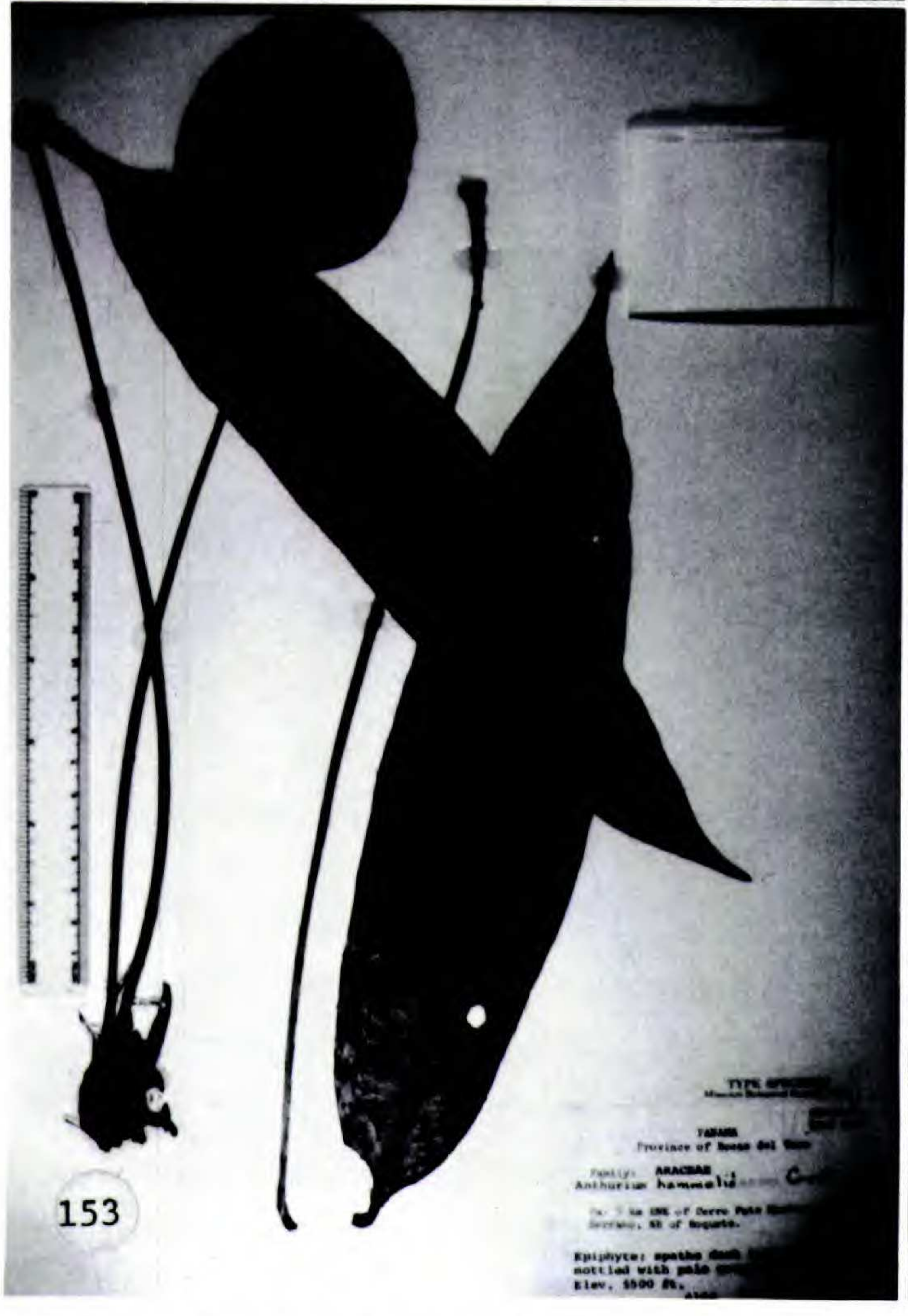


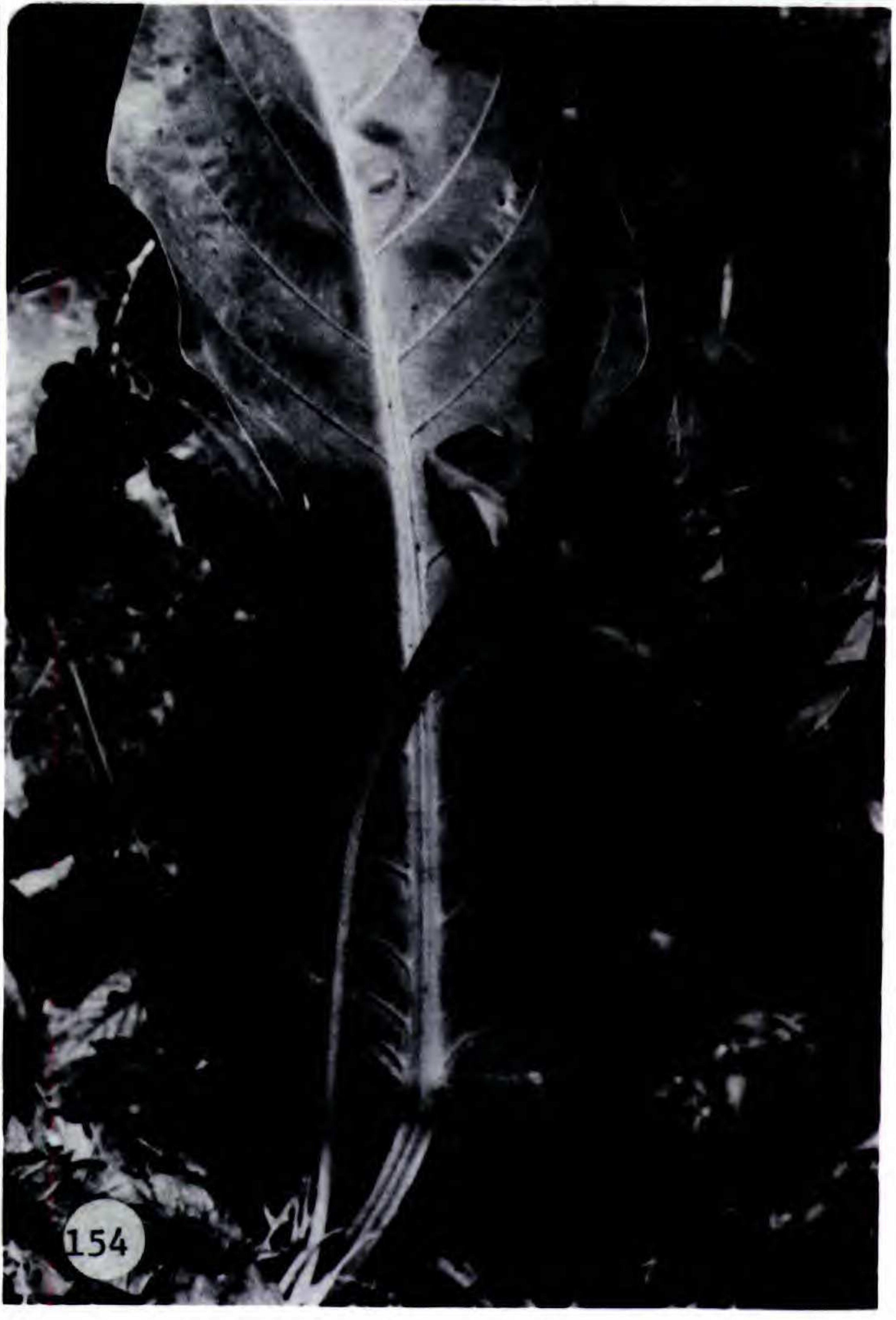


FIGURES 147–150.—147. *Anthurium halmoorei* Croat, *Croat 45337*.—148. *A. hammelii* Croat, *Hammel 6160* (photo: Hammel).—149. *A. harlingianum* Croat, Ecuador: Pastaza (not collected).—150. *A. harlingianum* Croat, *Croat 49688*.

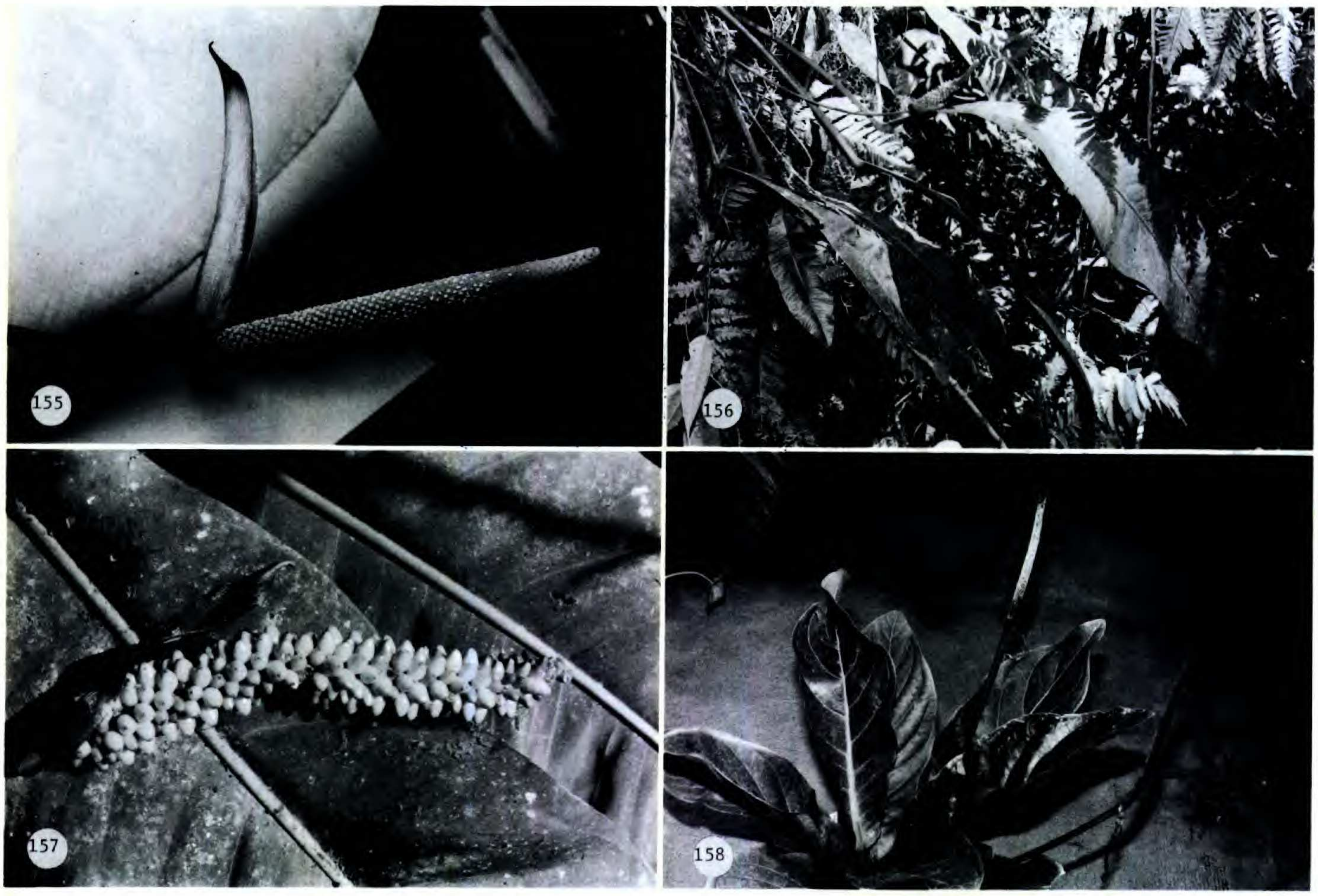




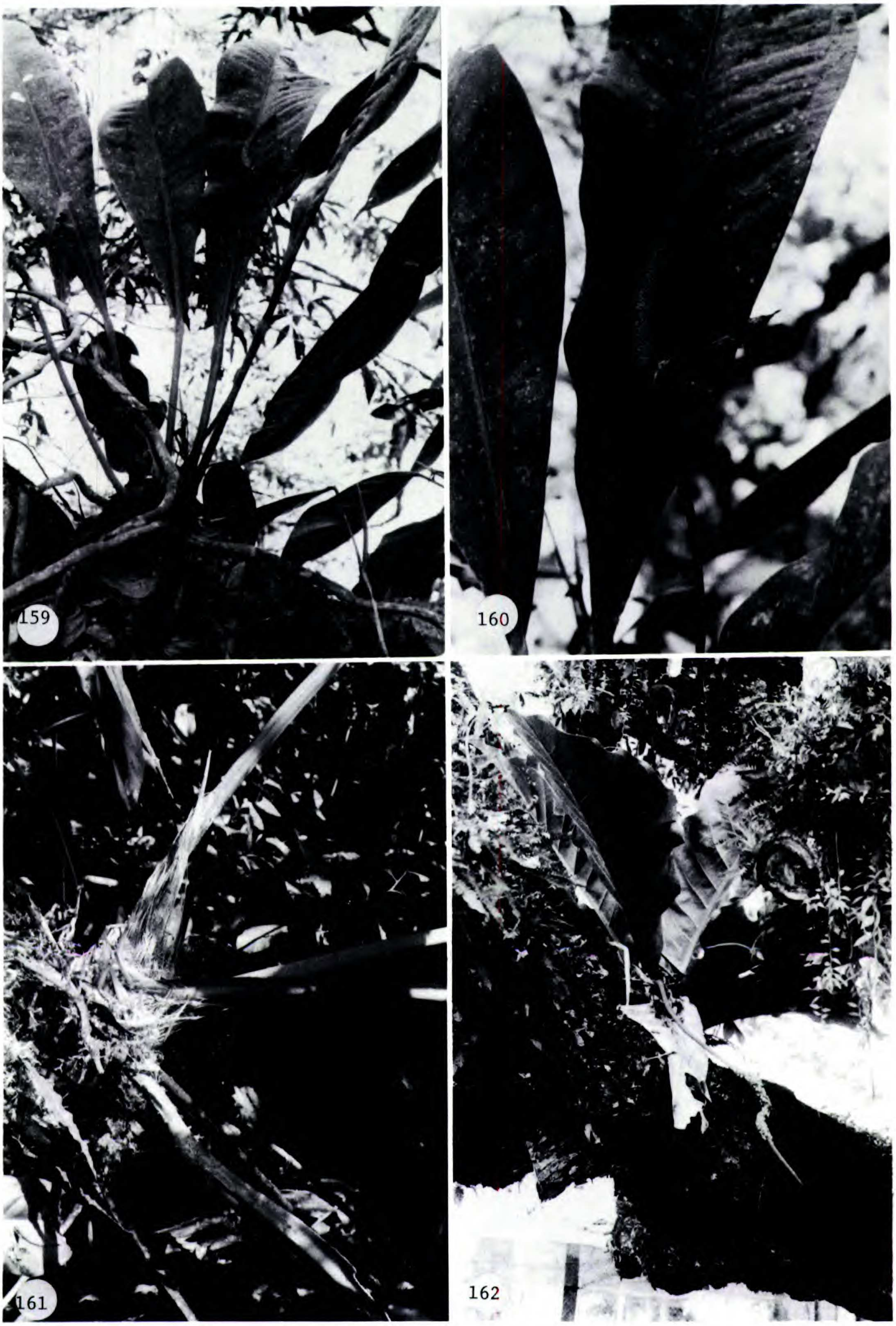




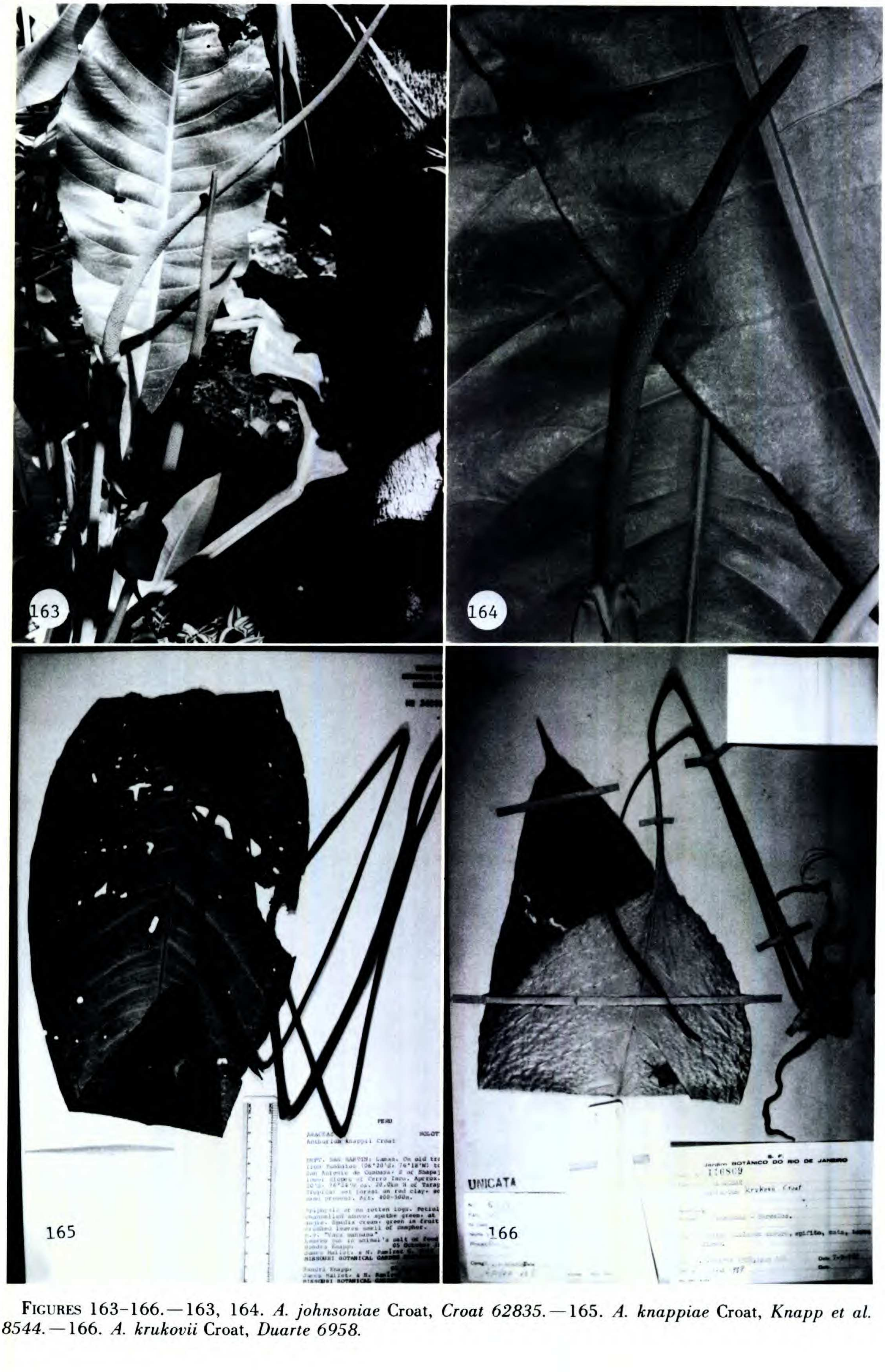
FIGURES 151-154.—151. *Anthurium glaucospadix* Croat, *Croat 57518.*—152. *A. halmoorei* Croat, *Croat 45337.*—153. *A. hammelii* Croat, *Hammel 6160.*—154. *A. harlingianum* Croat, *Croat 49688.*



FIGURES 155–158.—155. *Anthurium harlingianum* Croat, *Croat 50290.*—156, 157. *A. holmnielsenii* Croat, *Croat 61640.*—158. *A. jenmanii* Engl., *Hay 2827.*



FIGURES 159–162.—159–160. *Anthurium holmnielsenii* Croat, *Croat 50689.*—161. *A. holmnielsenii* Croat, *Croat 61640.*—162. *A. jenmanii* Engl., cultivated at Port of Spain Bot. Gard.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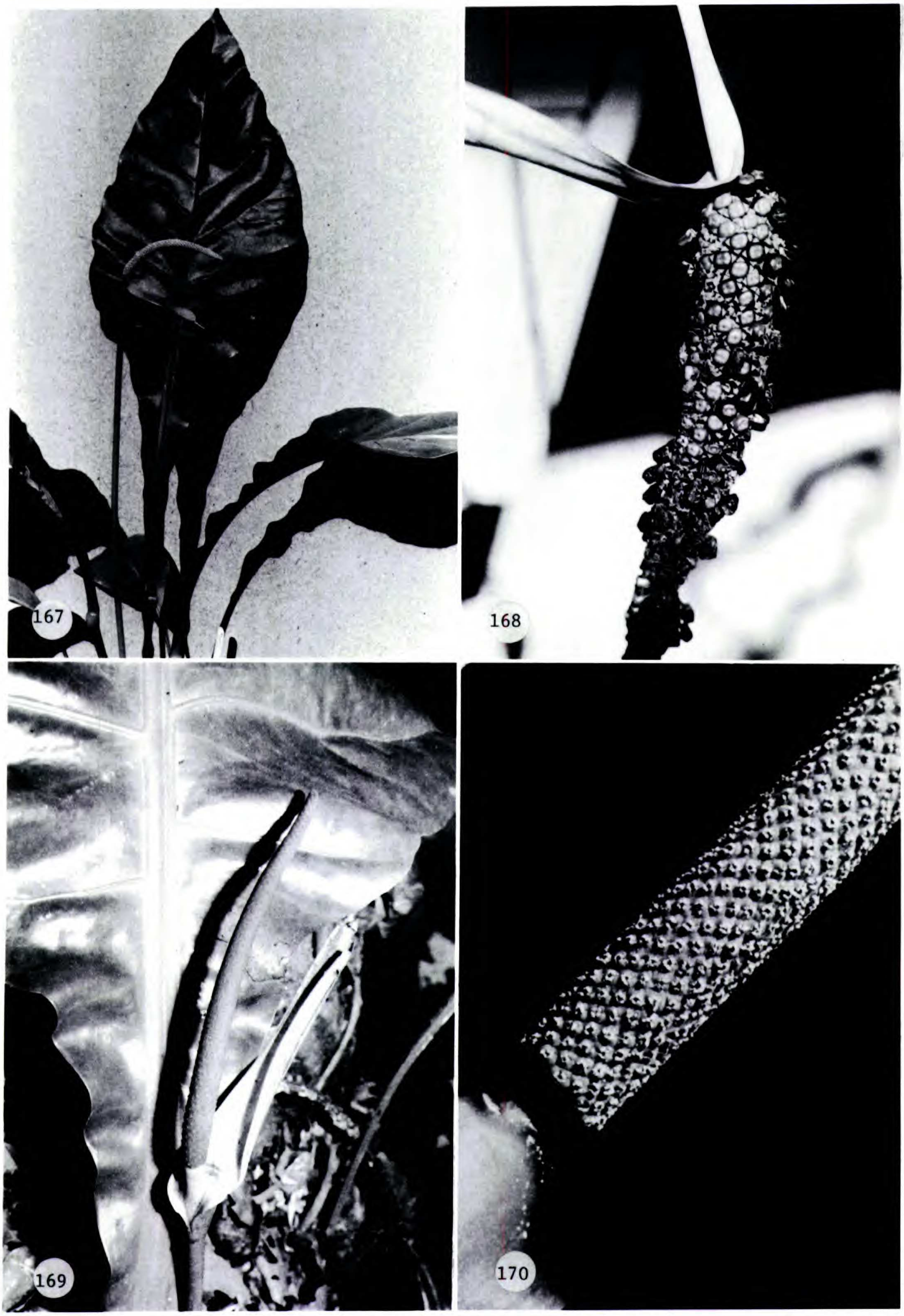
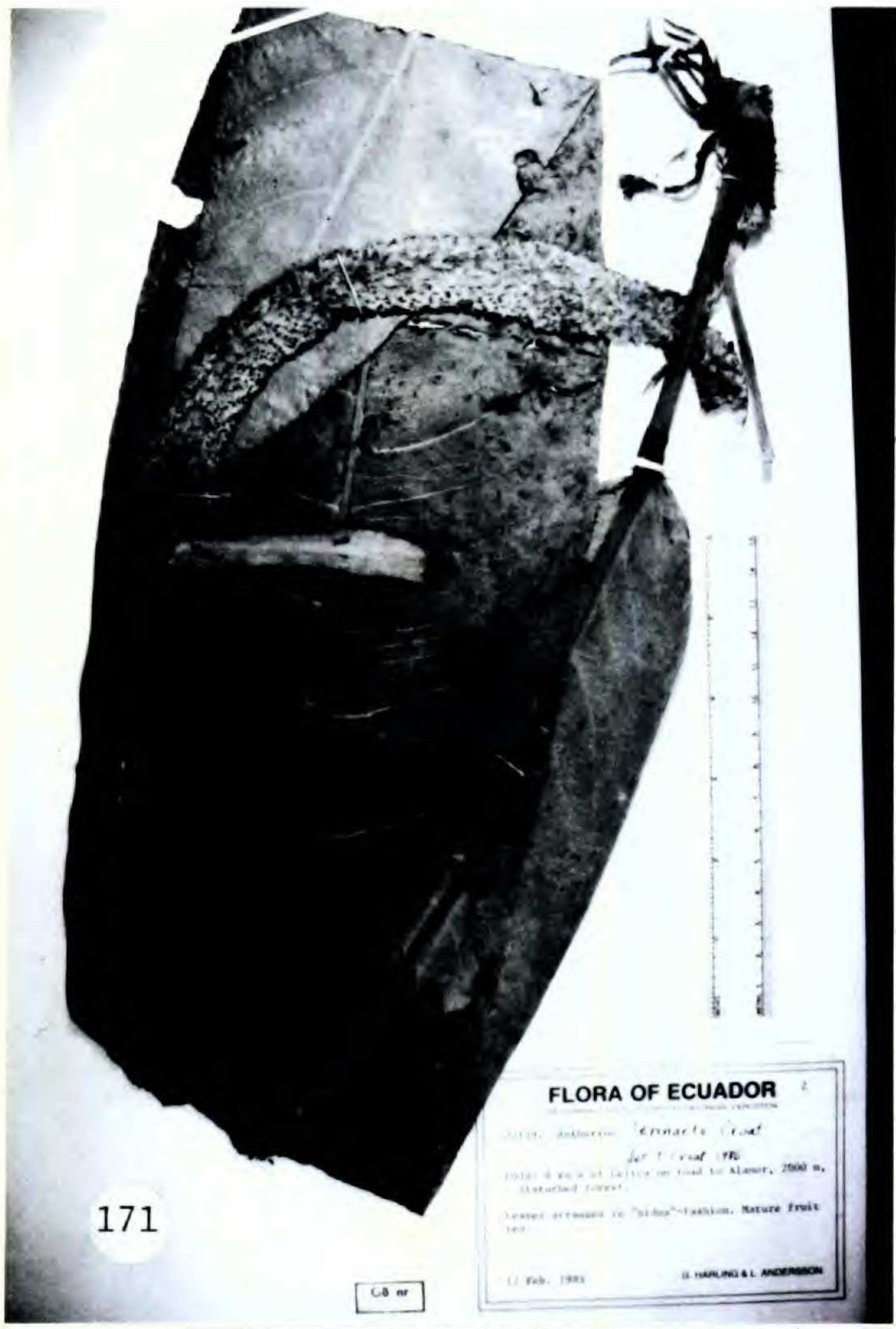
FIGURES 163-166.—163, 164. *A. johnsoniae* Croat, *Croat 62835*.—165. *A. knappiae* Croat, *Knapp et al. 8544*.—166. *A. krukovii* Croat, *Duarte 6958*.



FIGURES 167–170.—167, 168. *Anthurium latissimum* Engl., *Croat 57727*.—169. *A. latissimum* Engl., *Croat 51171*.—170. *A. latissimum* Engl., *Croat 52230*.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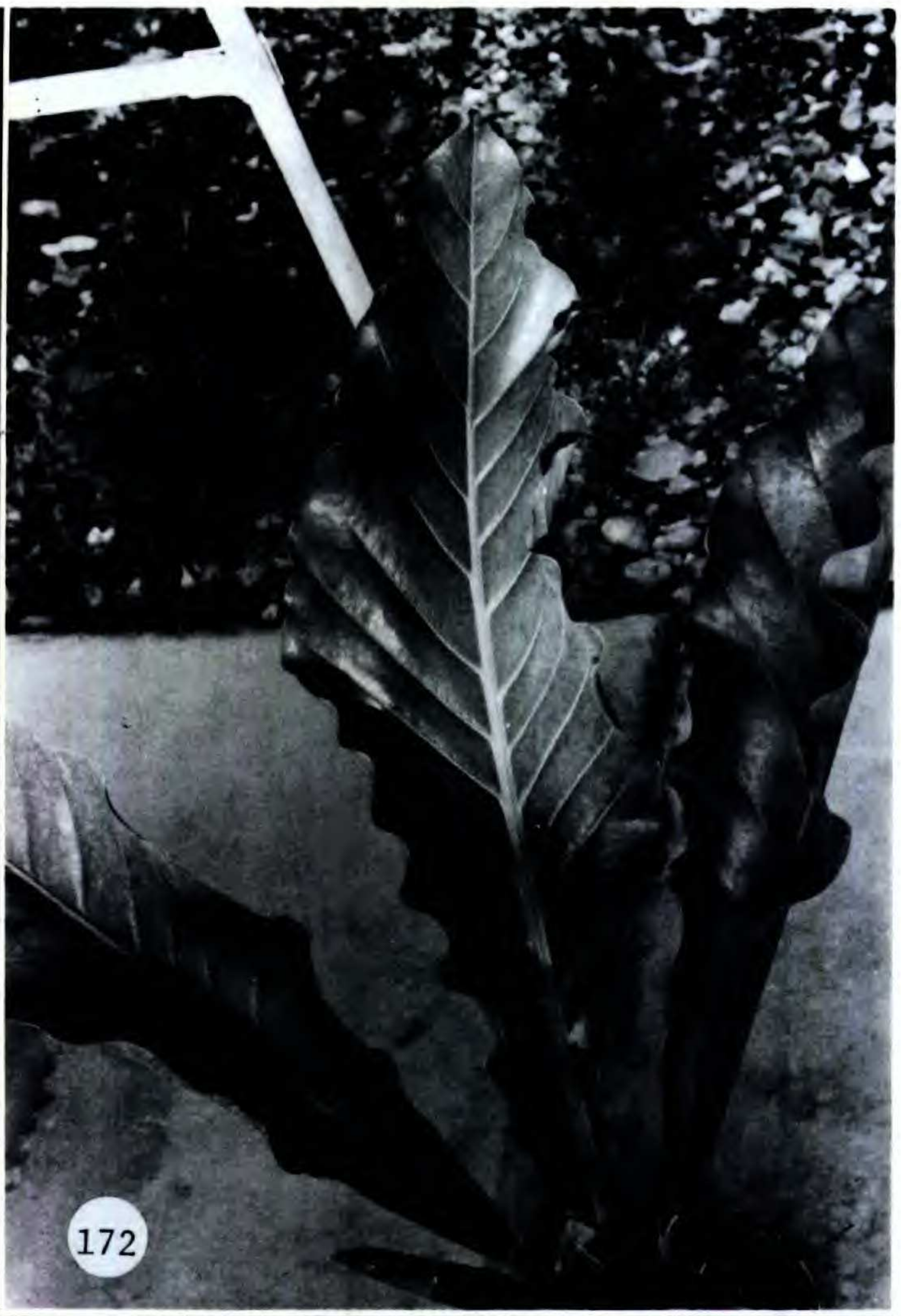
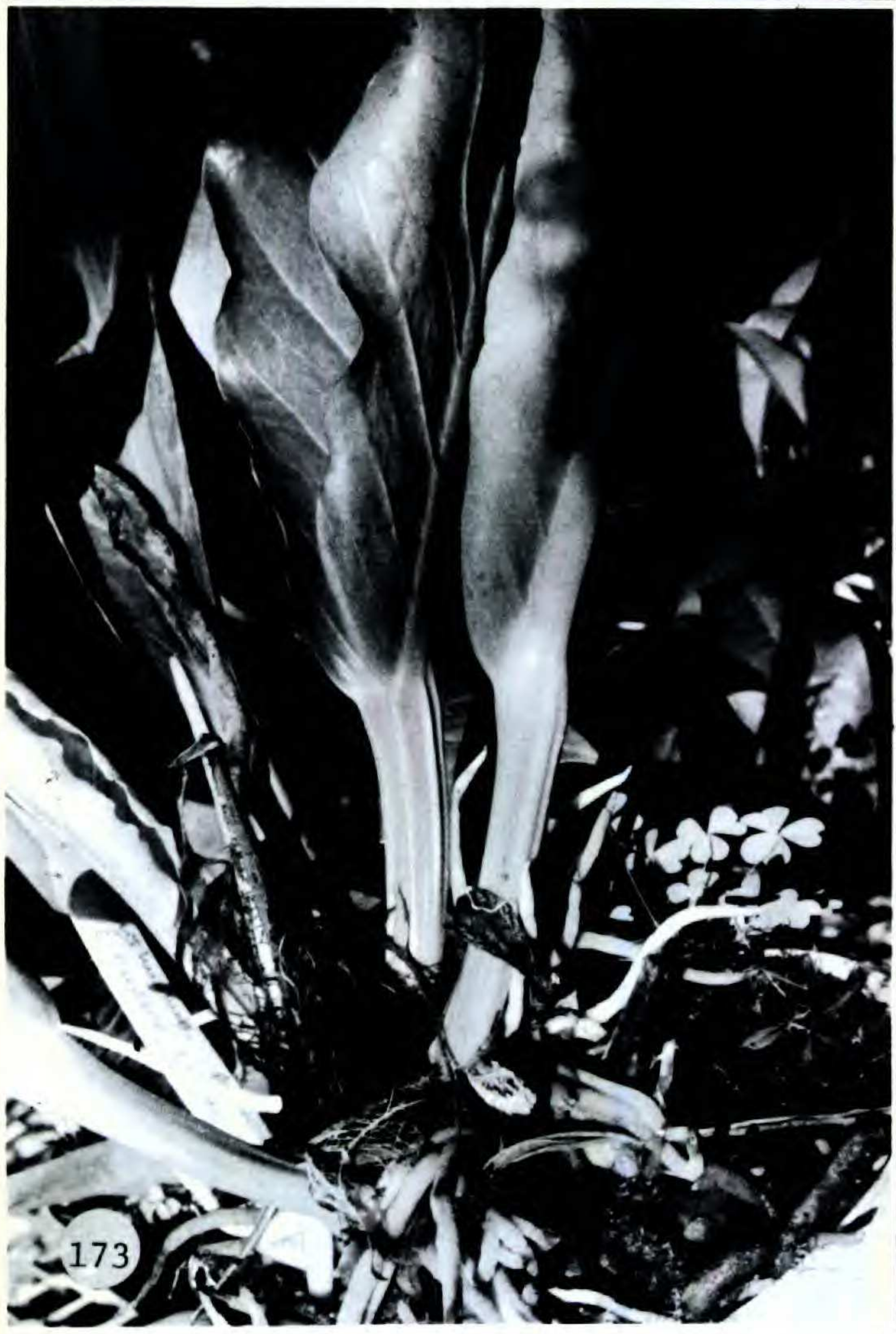
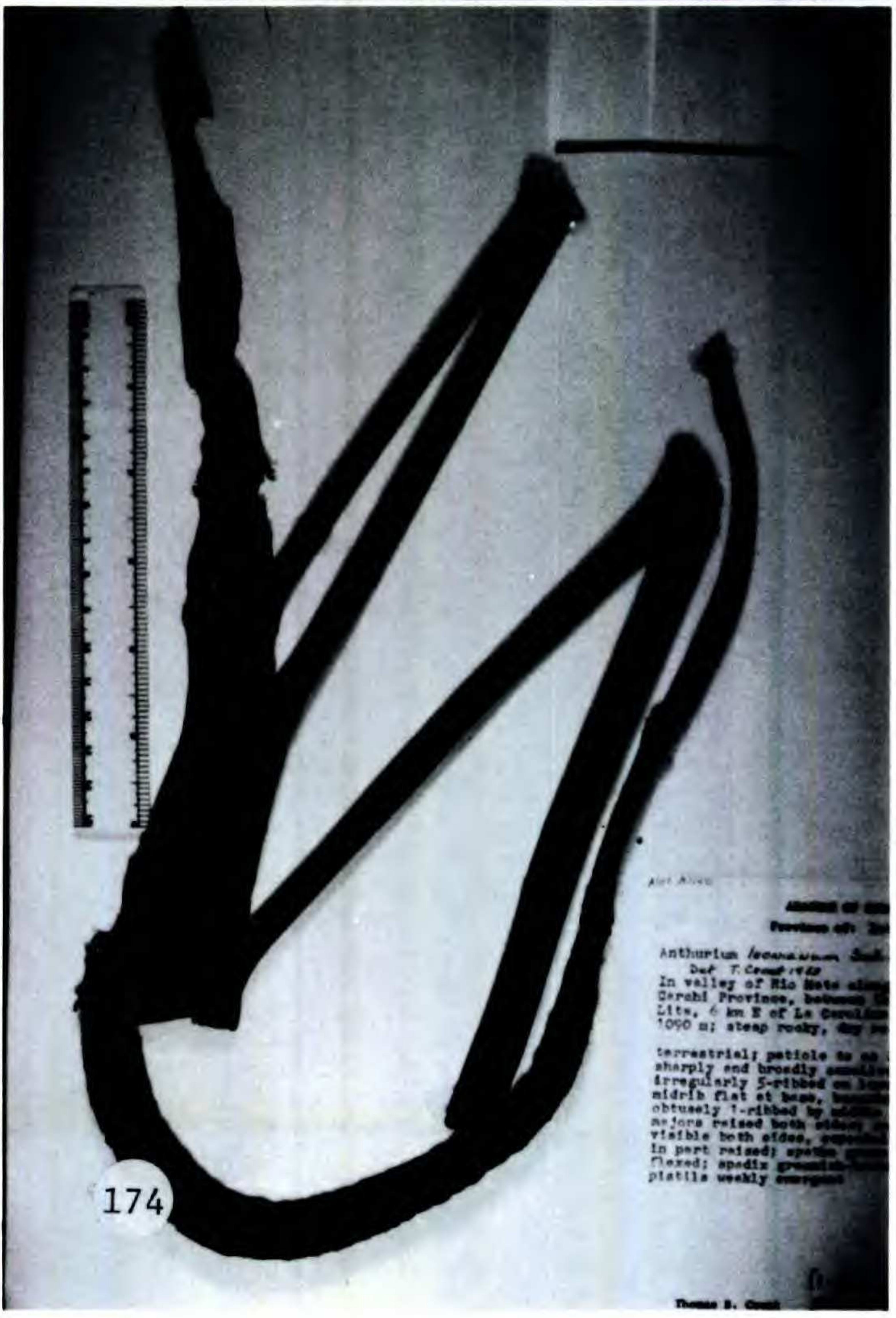
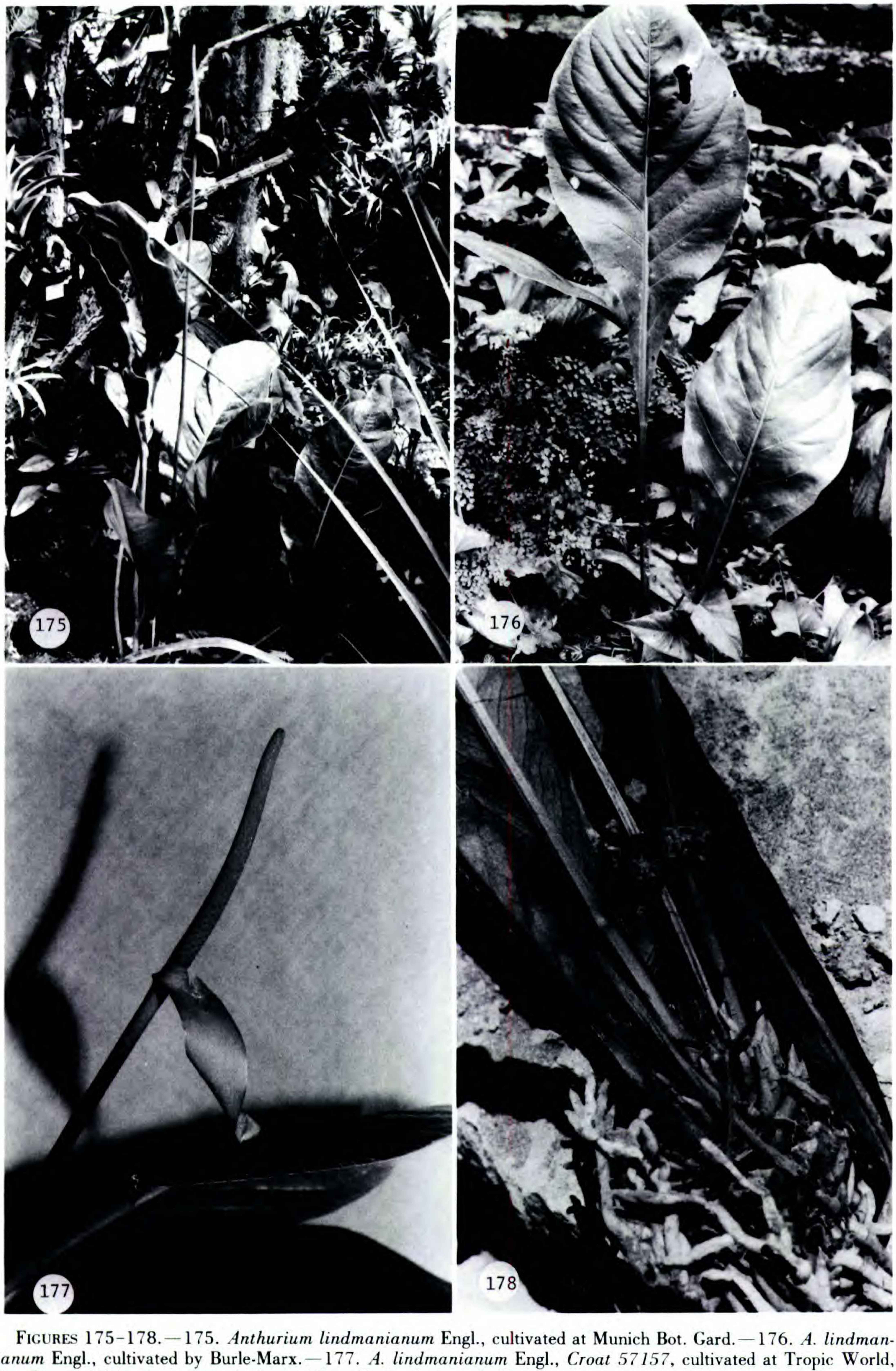


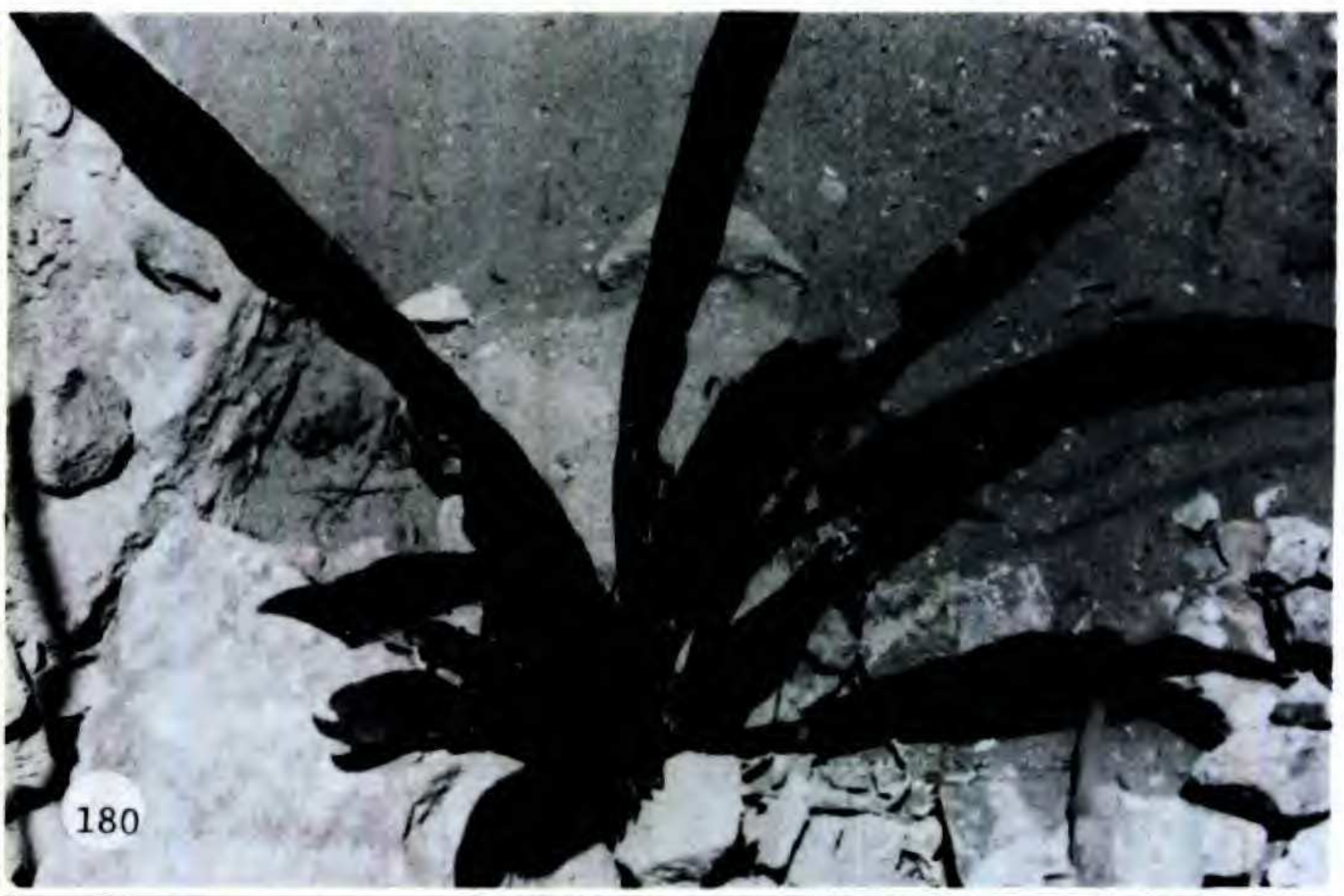


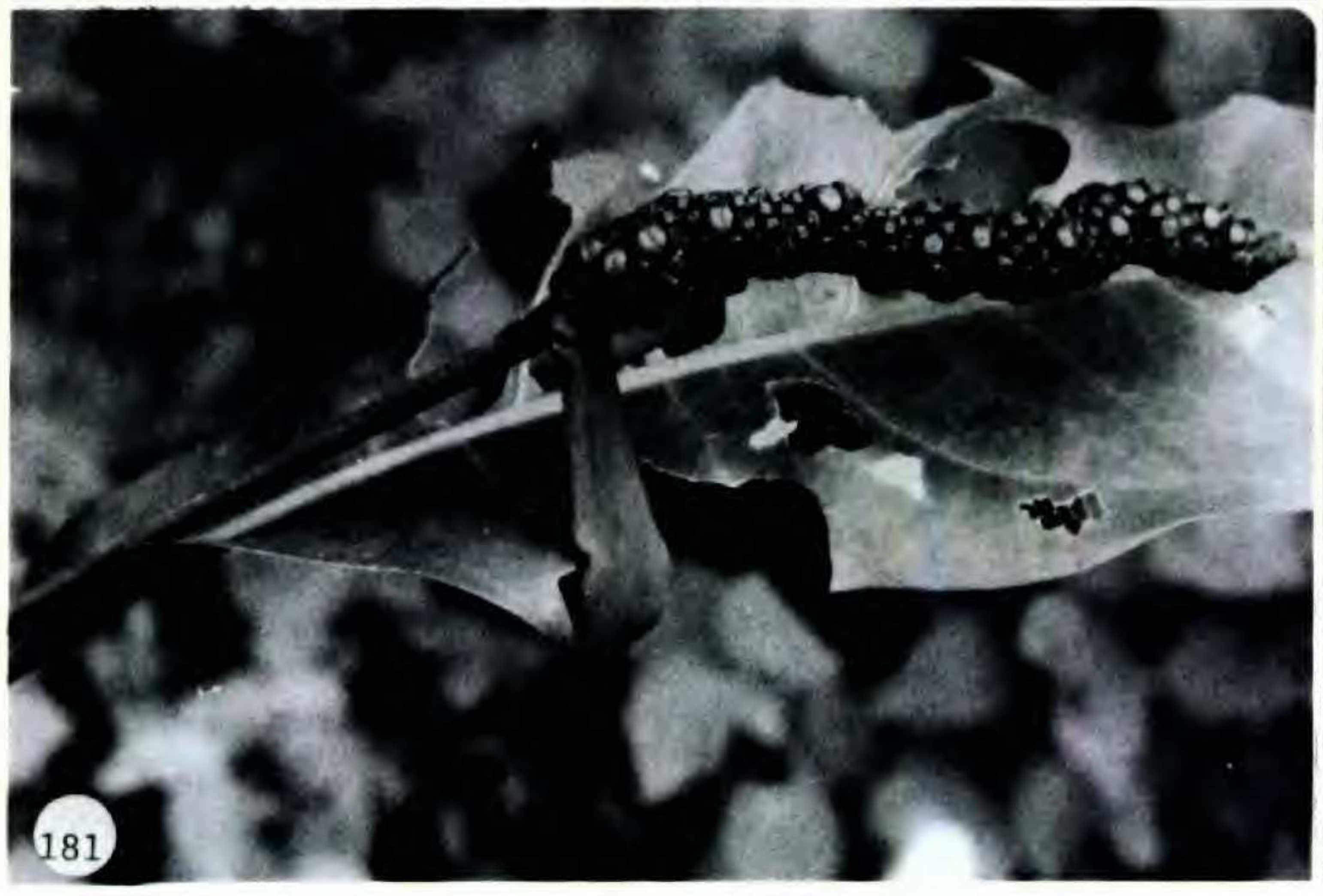


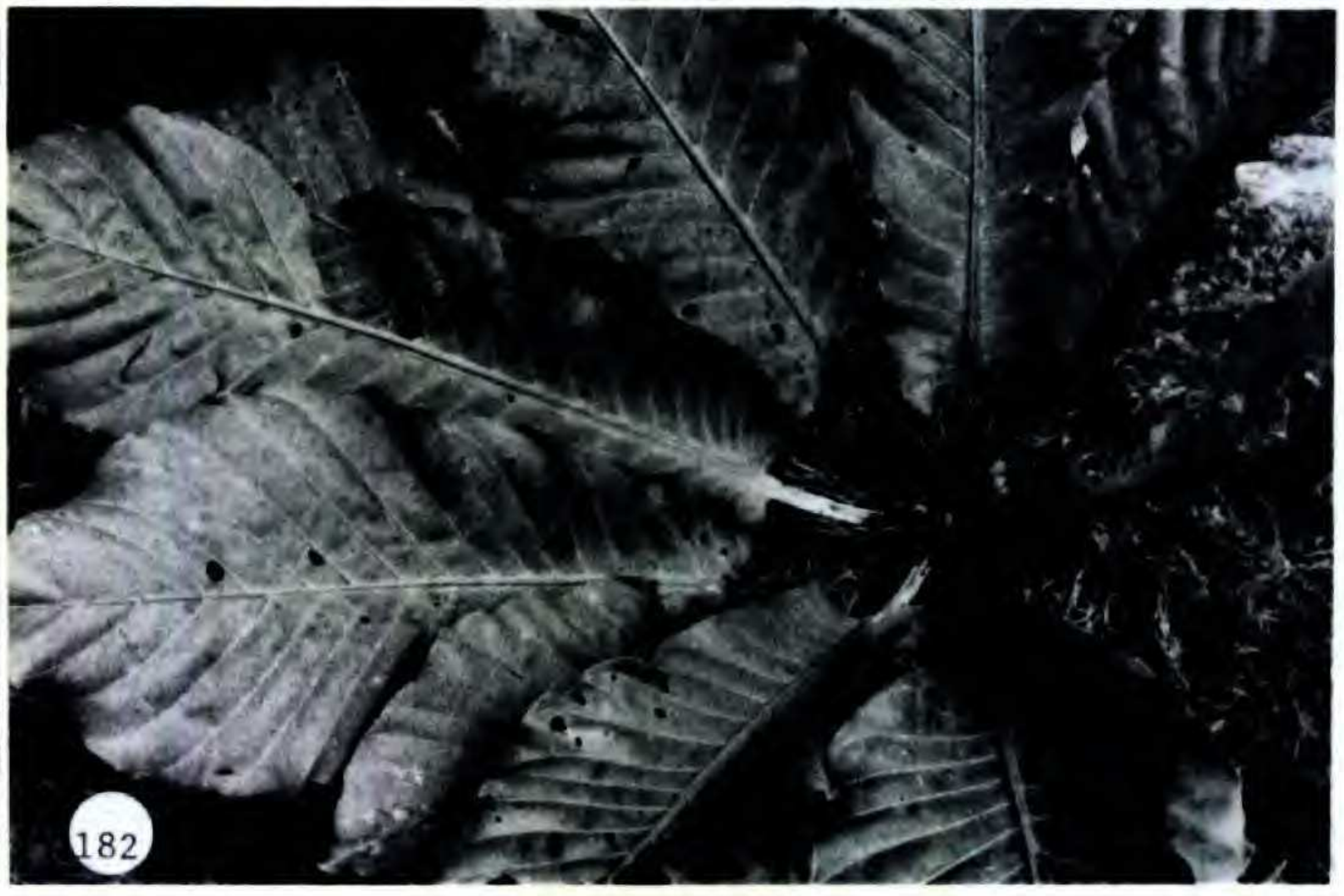
FIGURES 171–174.—171. *Anthurium lennartii* Croat, *Harling & Andersson 22159.*—172, 173. *A. leonianum* Sodiro, *Madison et al. 4960.*—174. *A. leonianum* Sodiro, *Croat 38986.*



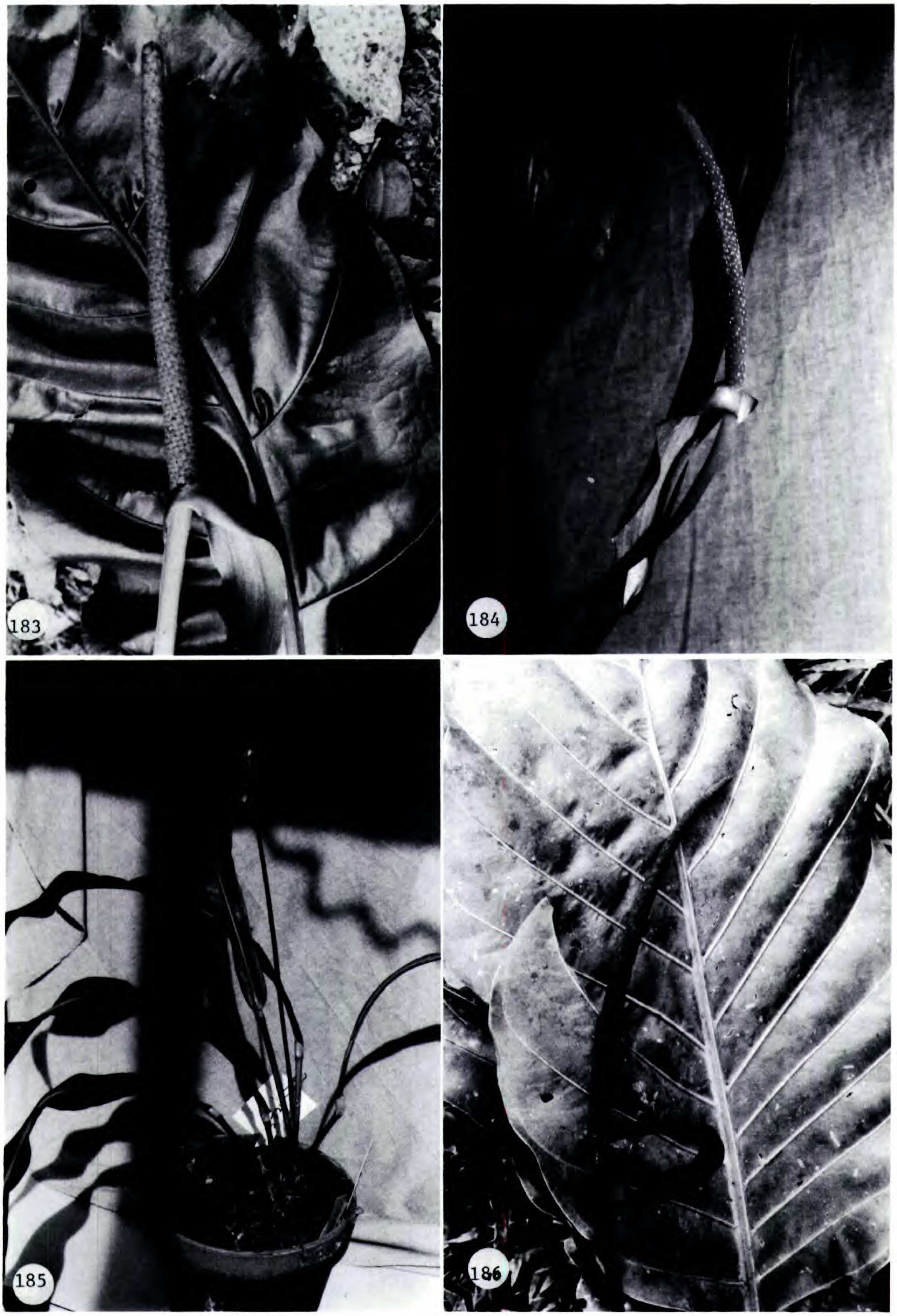
FIGURES 175–178.—175. *Anthurium lindmanianum* Engl., cultivated at Munich Bot. Gard.—176. *A. lindmanianum* Engl., cultivated by Burle-Marx.—177. *A. lindmanianum* Engl., *Croat 57157*, cultivated at Tropic World, San Diego, California.—178. *A. linguifolium* Engl., *Croat 50697*.



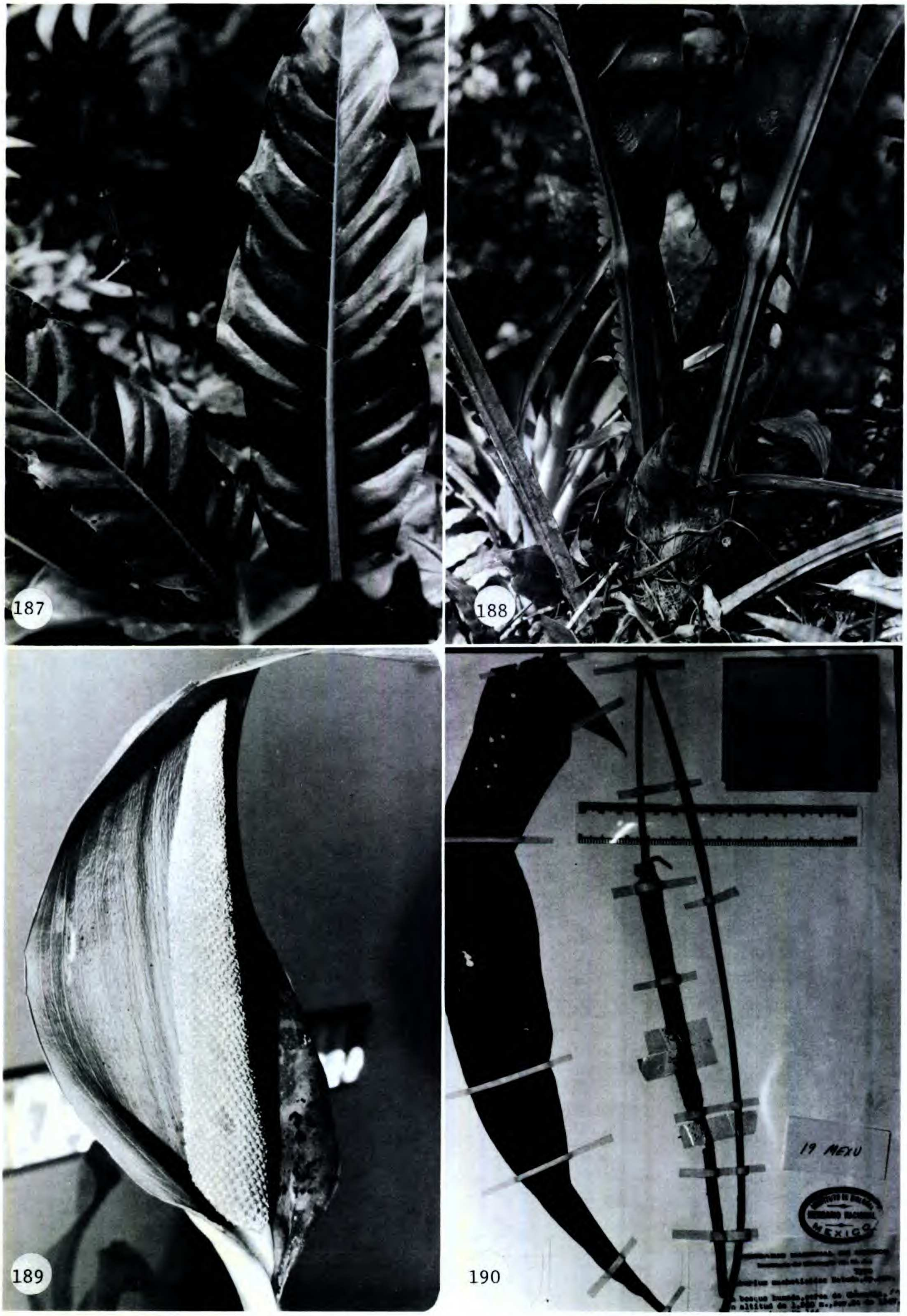




FIGURES 179–182.—179. *Anthurium johnsoniae* Croat, *Croat 62835*.—180. *A. linguifolium* Engl., *Croat 50697*.—181. *A. llewelynii* Croat, *Croat 51092*.—182. *A. loretense* Croat, *Croat 51225*.



FIGURES 183–186.—183, 184. *Anthurium llewelynii* Croat, *Croat 51092*.—185. *A. llewelynii* Croat, *Croat 57212*.—186. *A. loretense* Croat, *Croat 51225*.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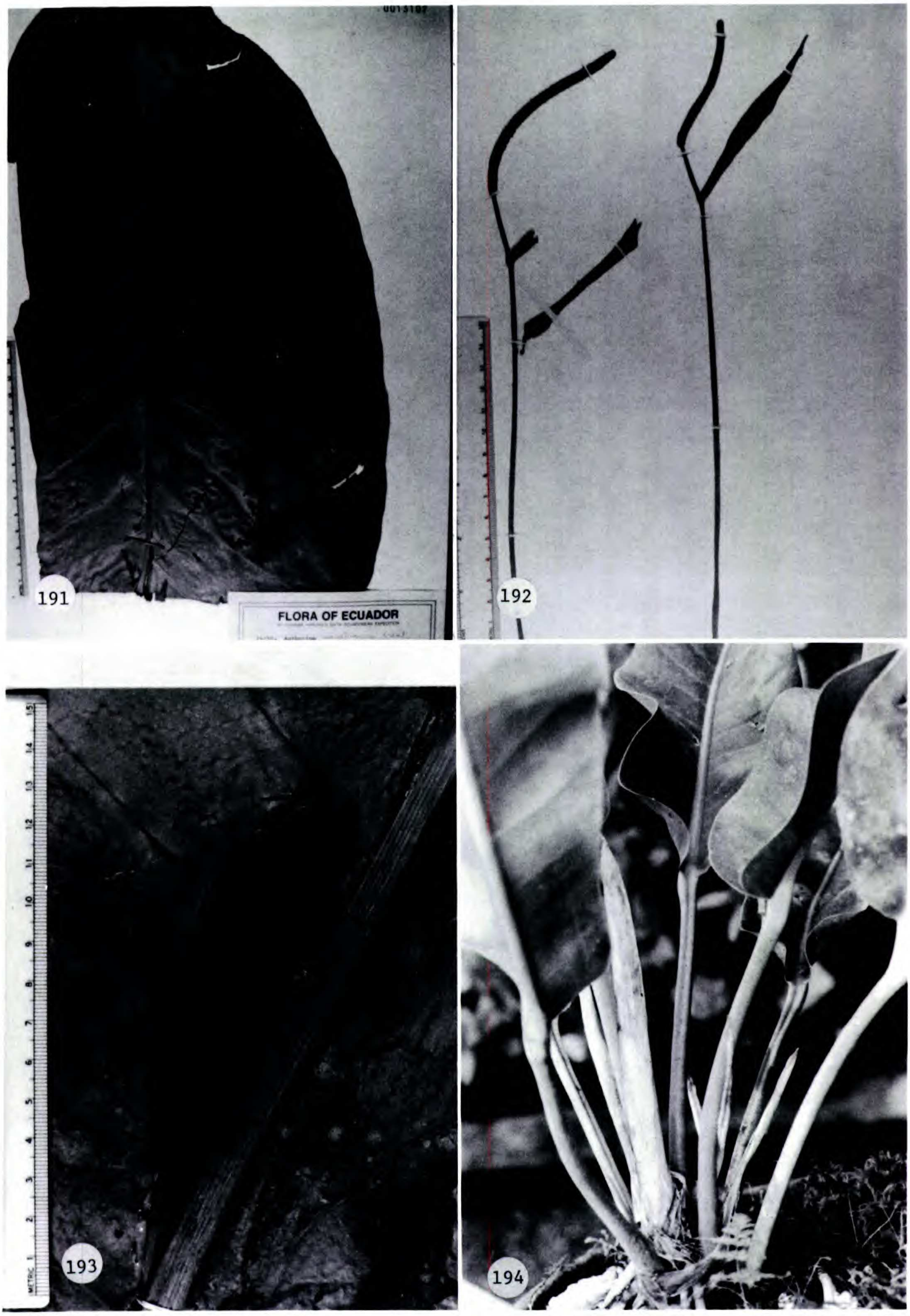
FIGURES 187–190.—187. *Anthurium luteynii* Croat, *Croat 49071.*—188. *A. luteynii* Croat, *Croat 27169.*—189. *A. luteynii* Croat, *Croat 25521.*—190. *A. machetioides* Matuda, *Ramirez 144.*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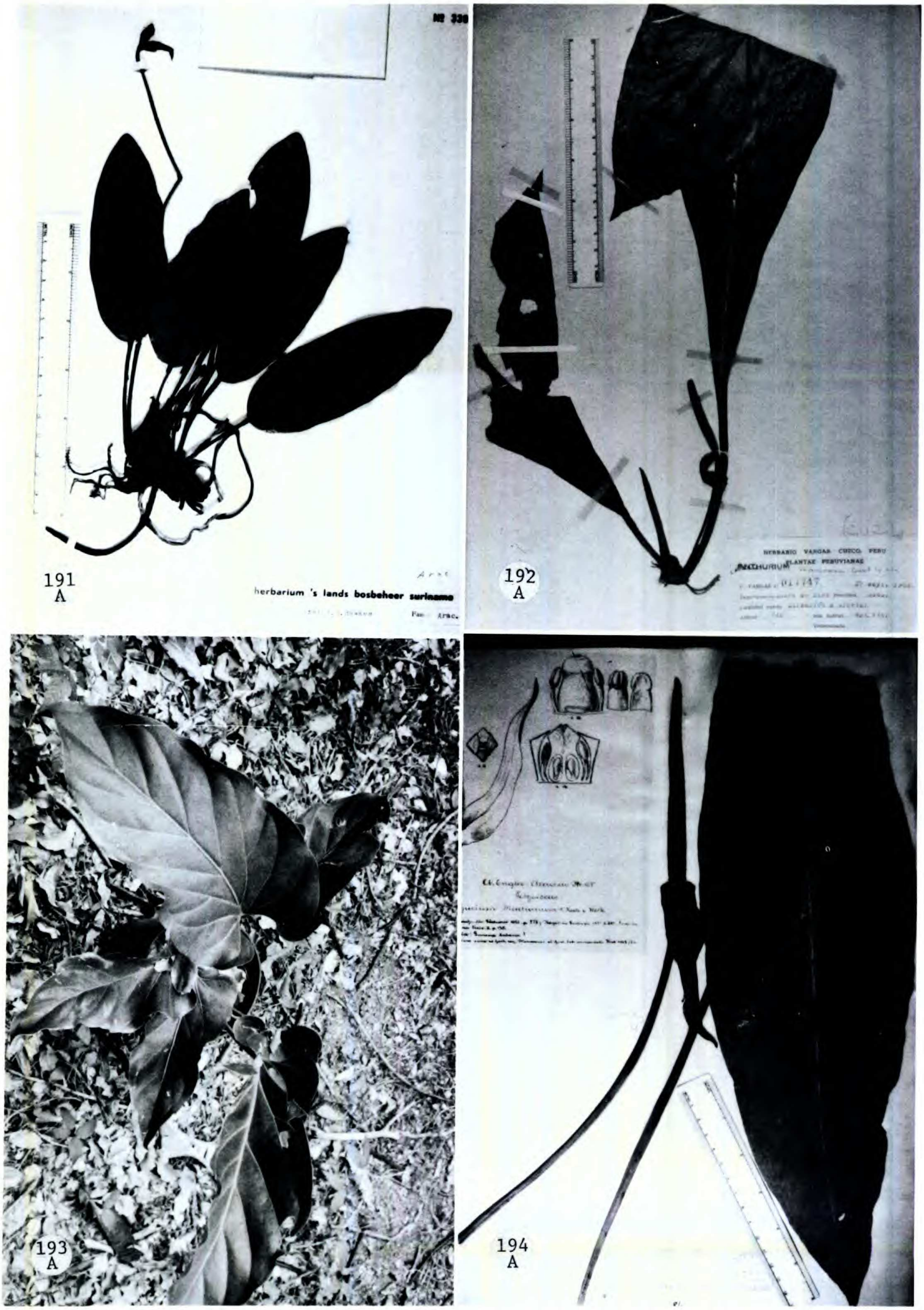
FIGURES 191–194.—191, 192. *Anthurium manabianum* Croat, *Harling & Andersson 24750.*—193. *A. galactospadix* Croat, *Prance et al. 2924.*—194. *A. martianum* K. Koch & Kolb, cultivated at Munich Bot. Gard.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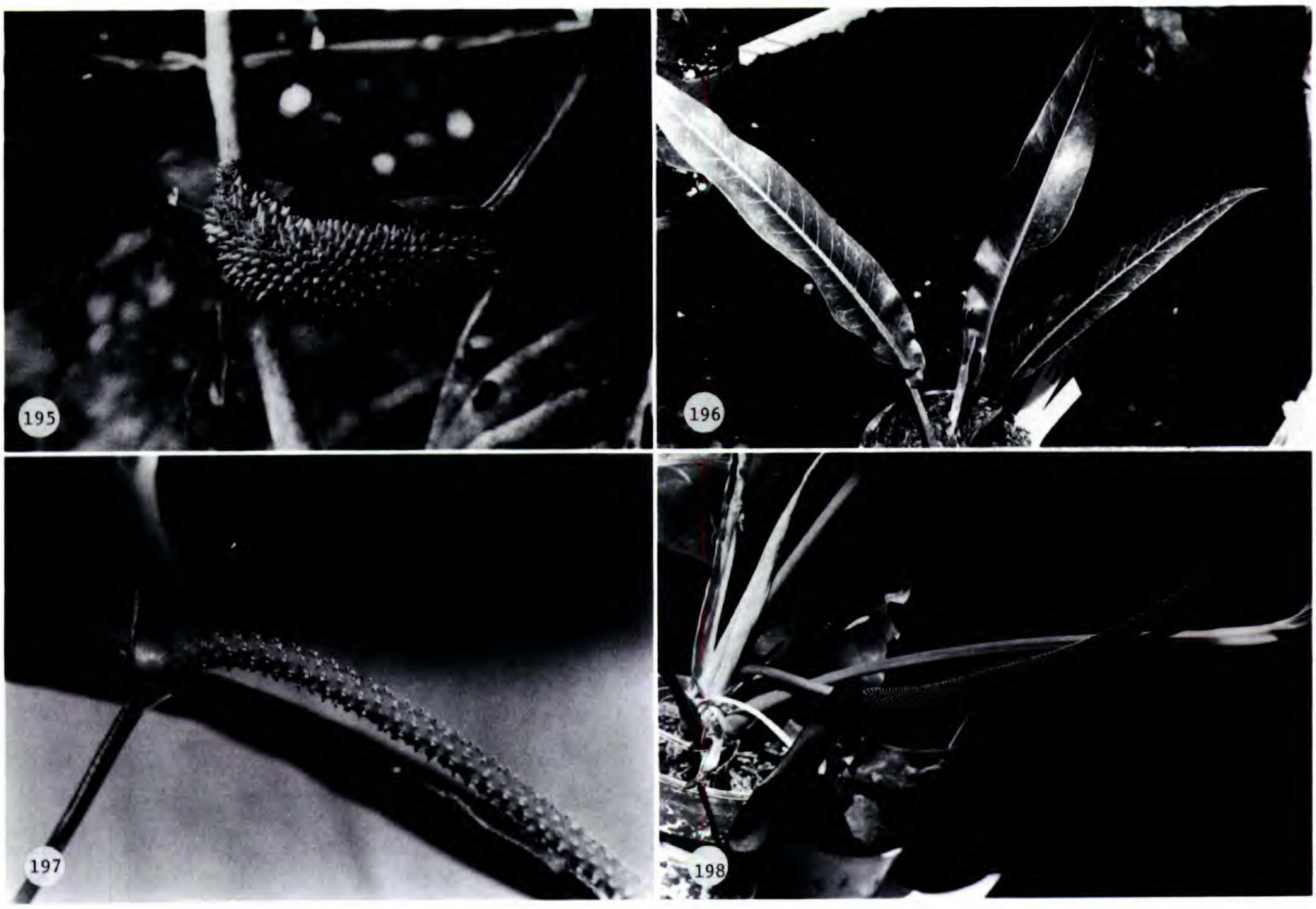
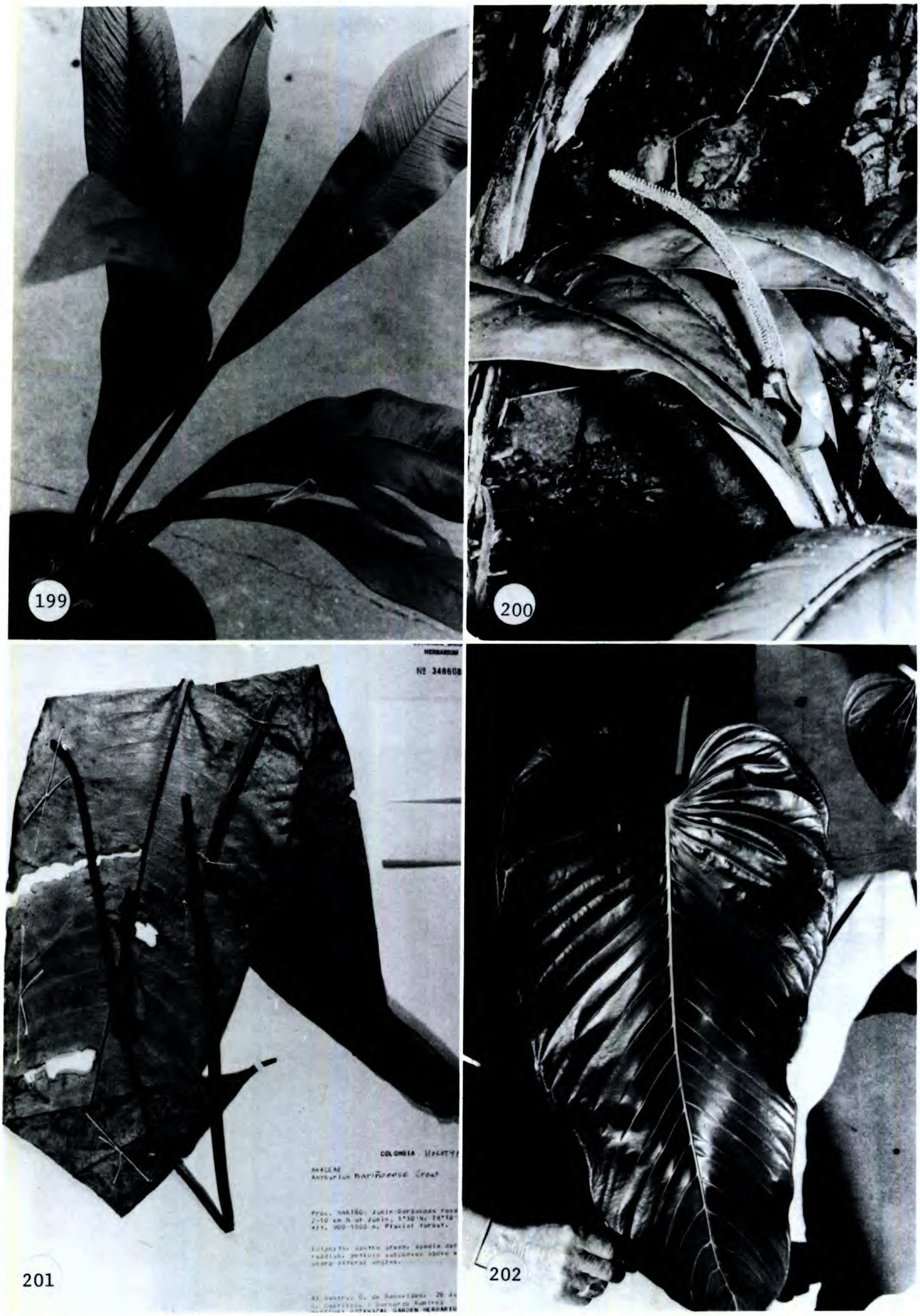
FIGURES 191A–194A.—191A. *Anthurium maguirei* A. Hawkes, *LBB 16571*.—192A. *A. manuanum* Croat, *Vargas 17747*.—193A. *A. selloum* K. Koch, St. Johns, Virgin Is., cultivated by Conrad Fleming.—194A. *A. martianum* K. Koch & Kolb, cultivated at Munich Botanical Garden.



FIGURES 195–198.—195. *Anthurium luteynii* Croat, *Croat 27156.*—196. *A. martianum* K. Koch & Kolb, cultivated at Munich Bot. Gard.—197. *A. napaeum* Engl., *Croat 55782.*—198. *A. nervatum* Croat, *Croat 27329.*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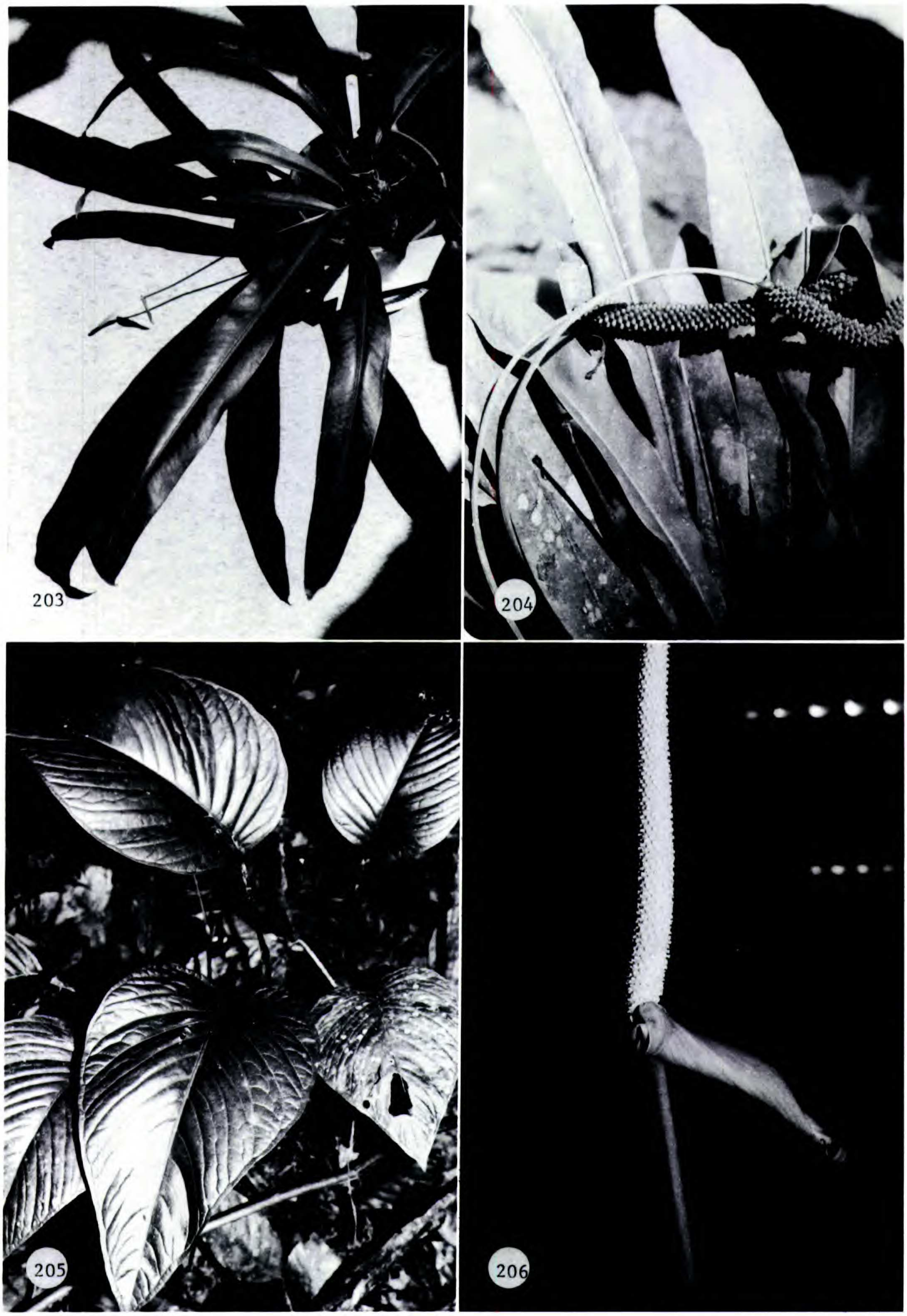
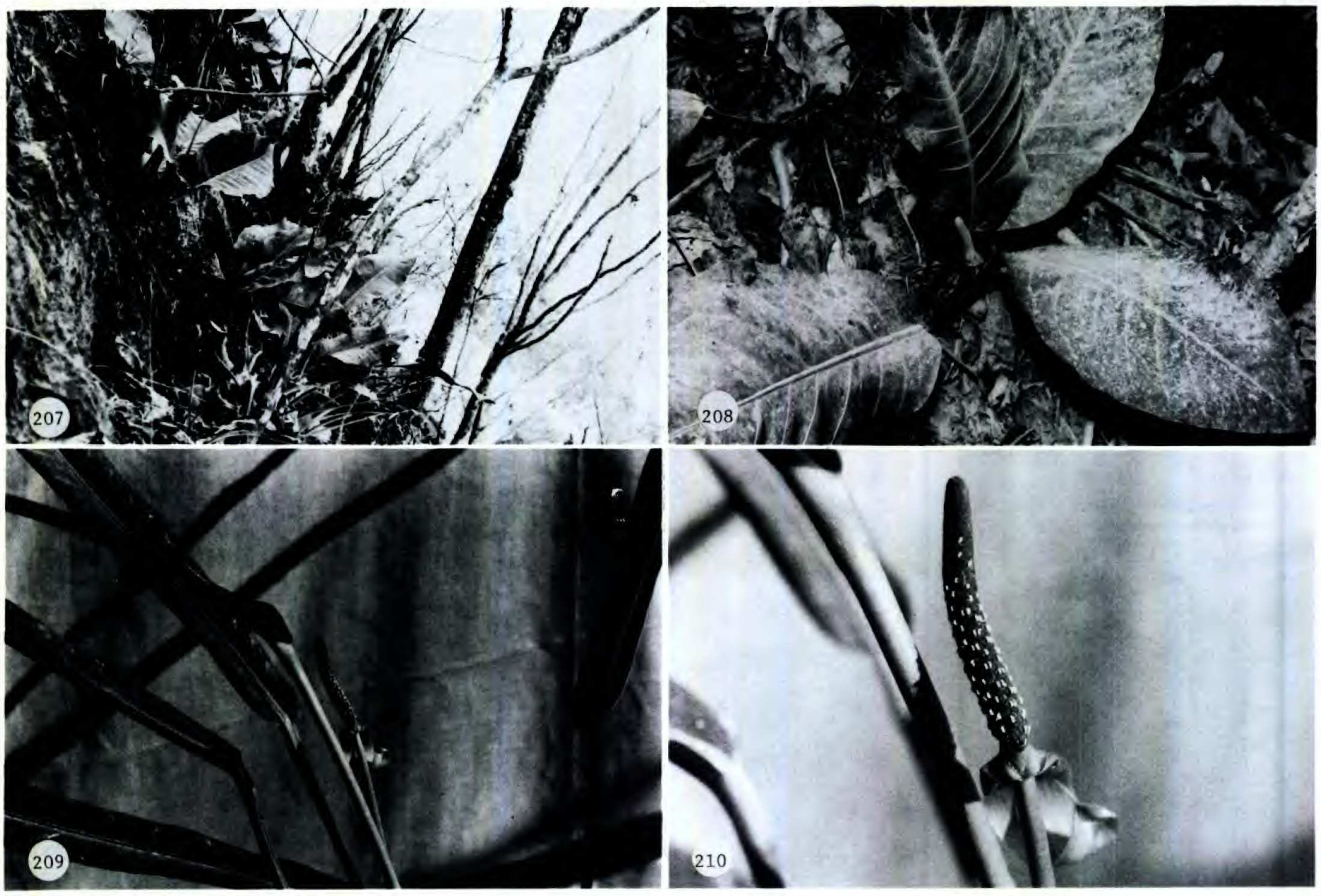
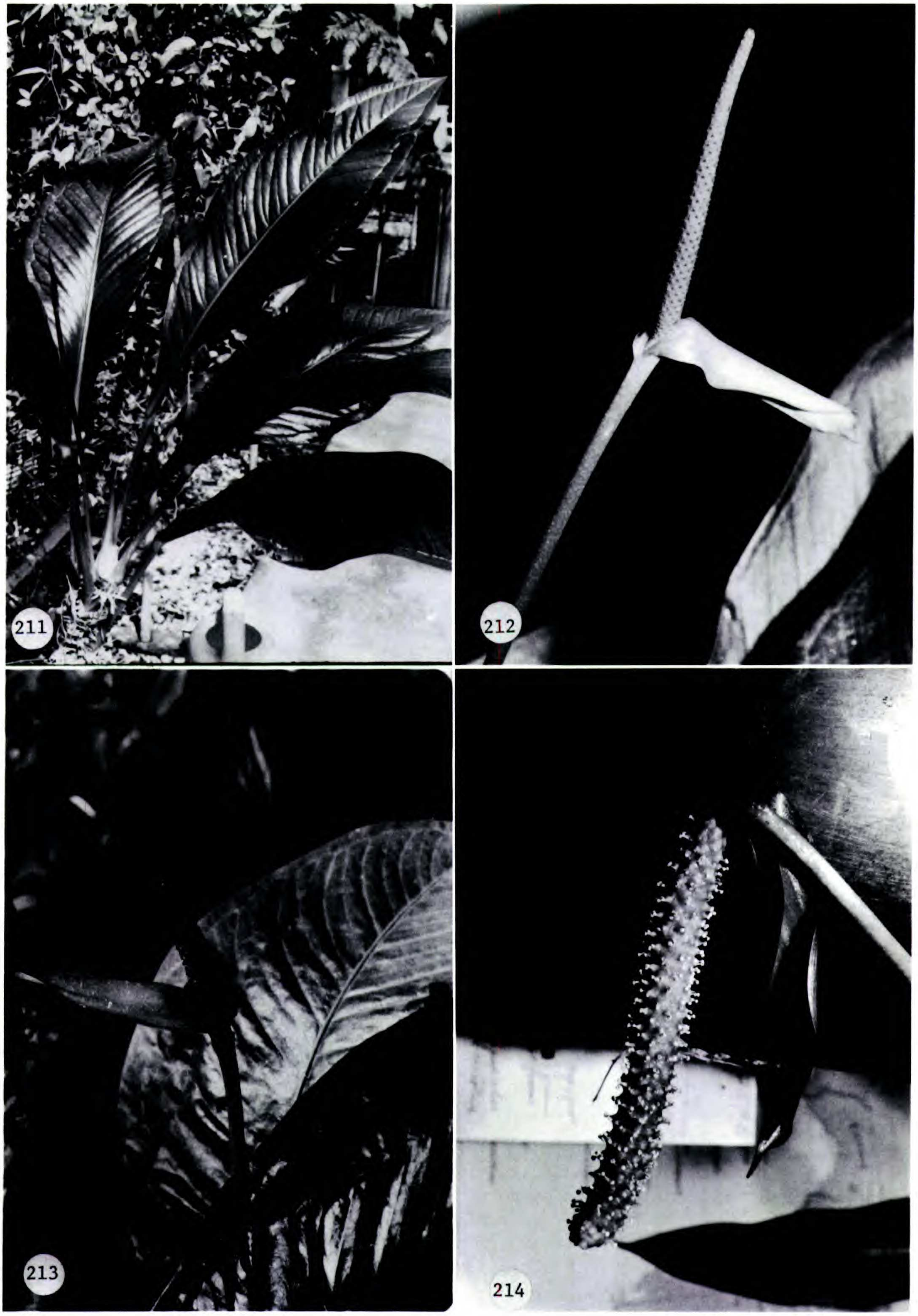
FIGURES 199–202.—199. *Anthurium napaeum* Engl., *Croat 57035.*—200. *A. napaeum* Engl., *Croat 50876.*—201. *A. narinoense* Croat, *Gentry et al. 55343.*—202. *A. nervatum* Croat, *Croat 48912.*



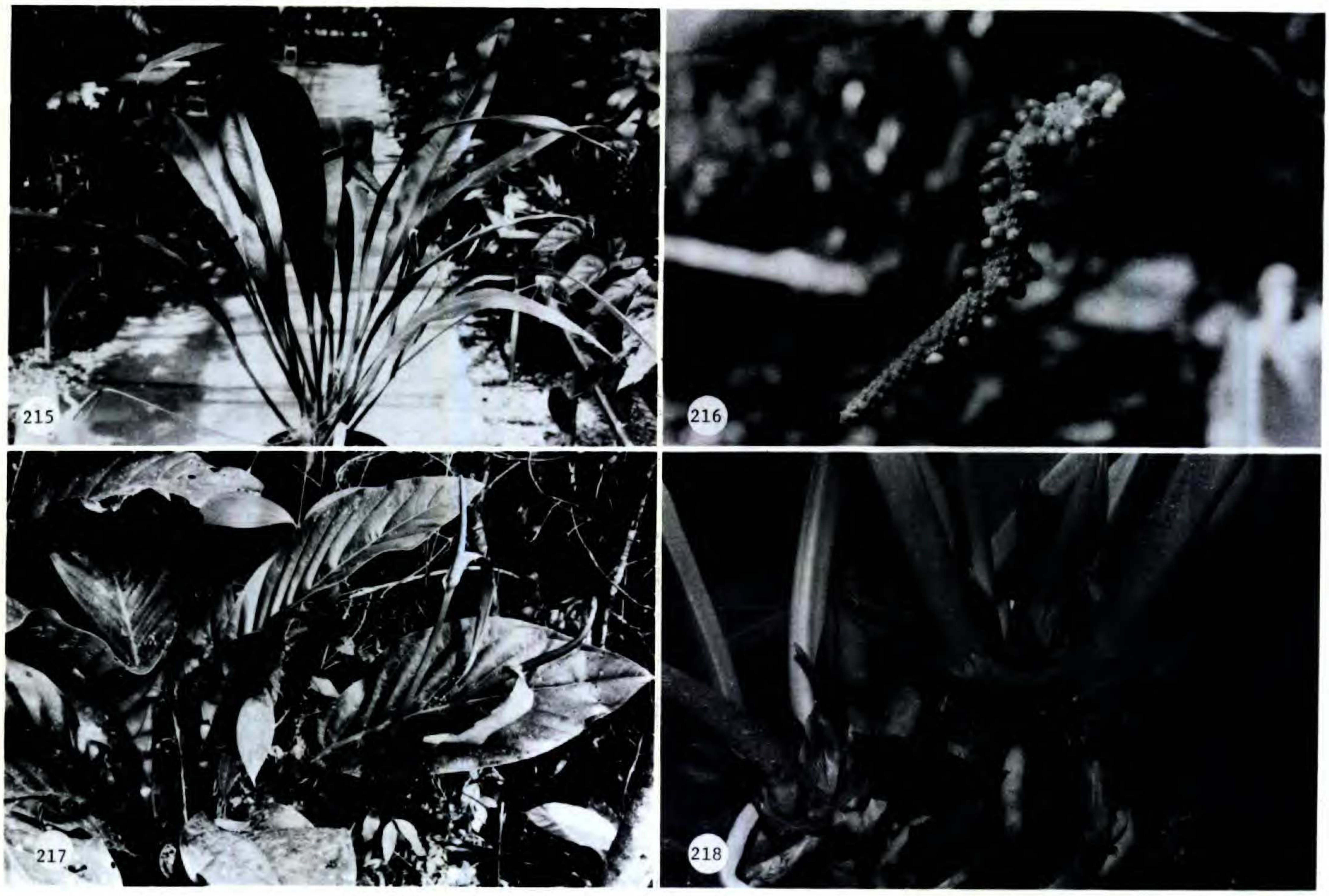
FIGURES 203–206.—203, 204. *Anthurium obscurinervium* Croat, *Croat 50914*.—205. *A. oerstedianum* Schott, *Croat 43419*.—206. *A. oerstedianum* Schott, *Croat 35293*.



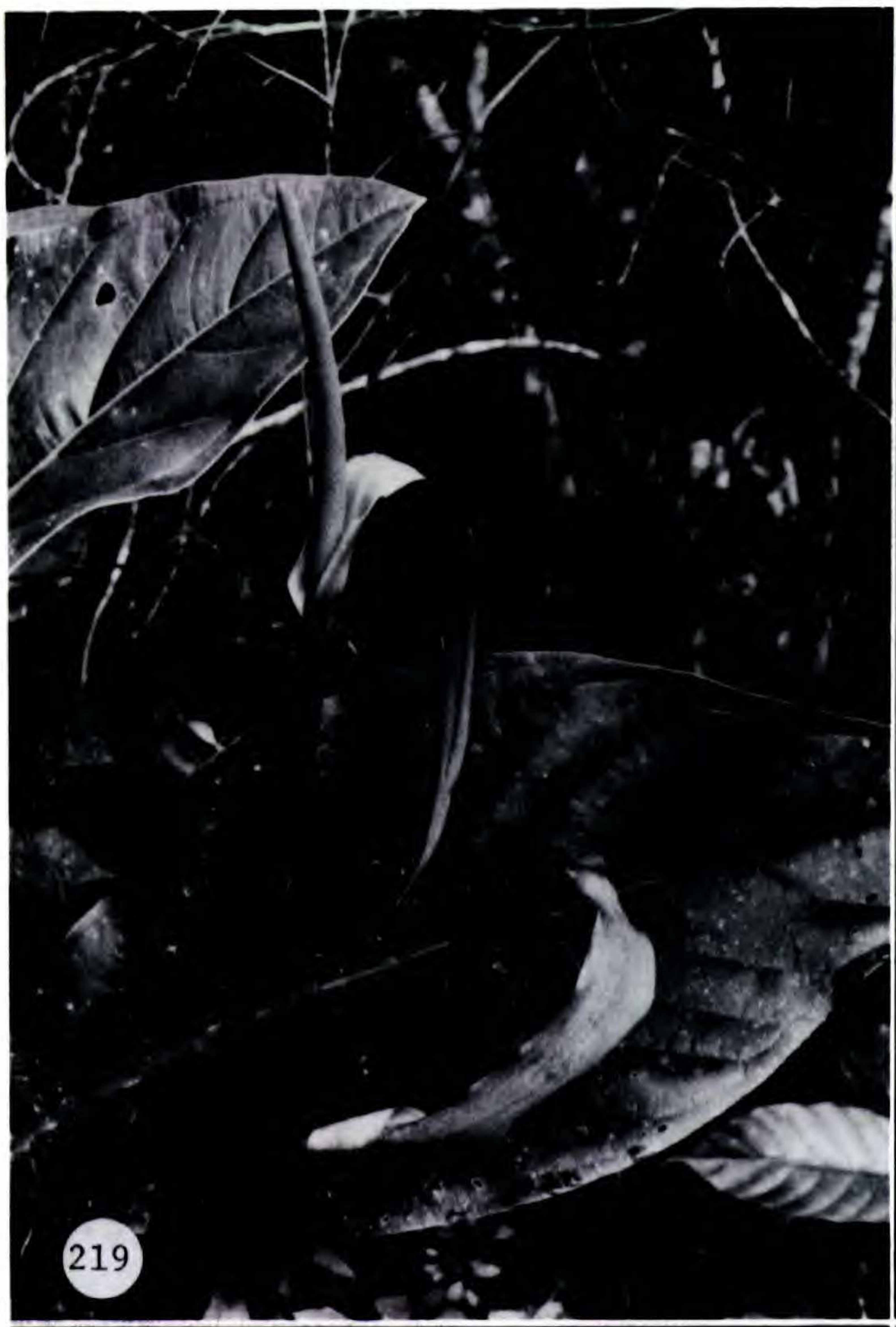
FIGURES 207–210.—207, 208. *Anthurium nizandense* Matuda, *Croat 45756*.—209, 210. *A. ottonis* K. Krause, *Solomon 8652*.



FIGURES 211–214.—211. *Anthurium oxycarpum* Poeppig, *Plowman 7569.*—212. *A. oxycarpum* Poeppig, *Plowman 3221.*—213. *A. oxycarpum* Poeppig, *Plowman & Kennedy 5699.*—214. *A. oxyphyllum* Sodiro, *Croat 38977.*



FIGURES 215-218.—215, 216. *Anthurium oxyphyllum* Sodiro, *Madison s.n.*, cultivated at Selby Gardens.—217. *A. pachylaminum* Croat, *Croat 58161*.—218. *A. pachylaminum* Croat, *Croat 50990*.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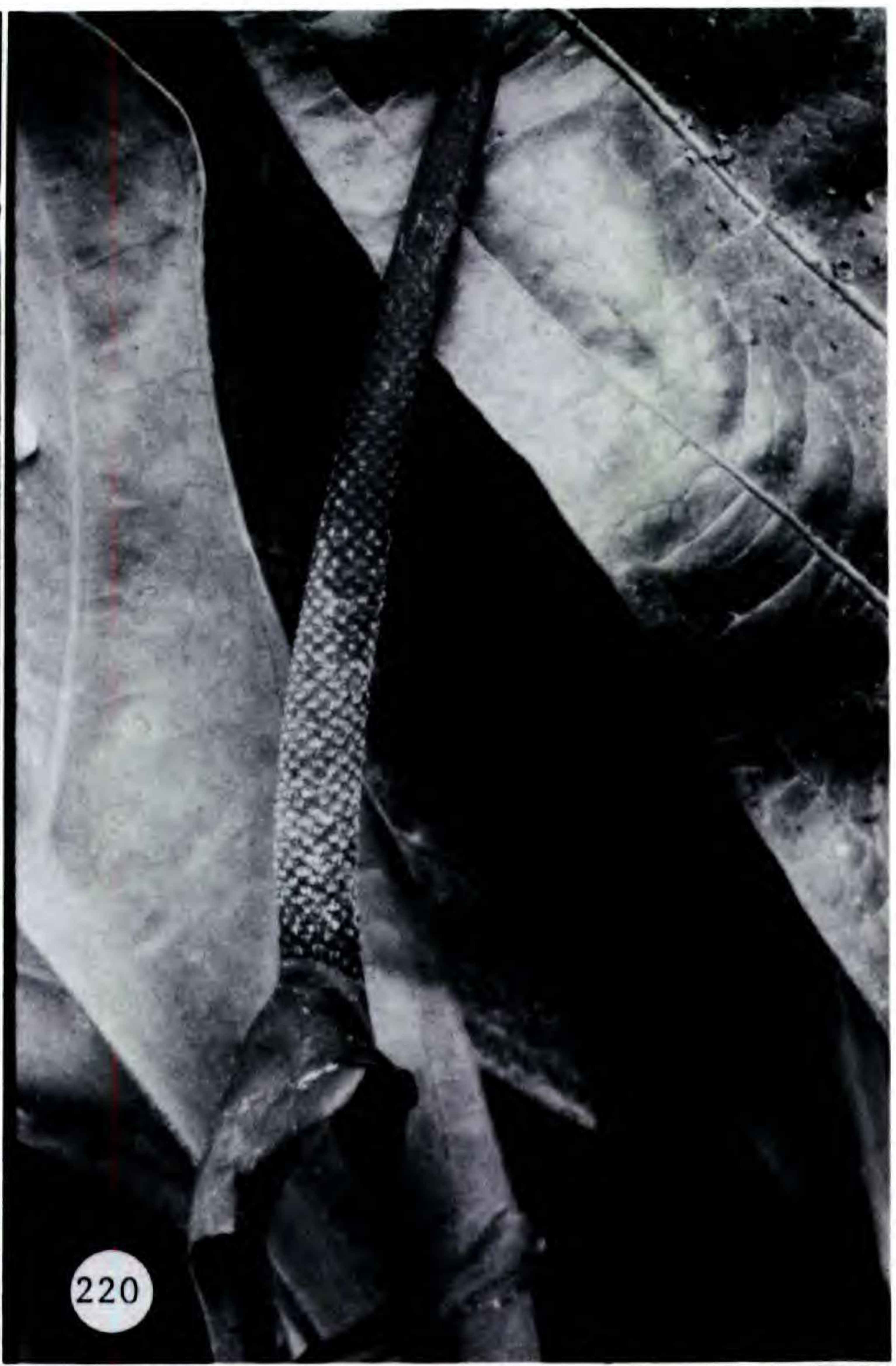
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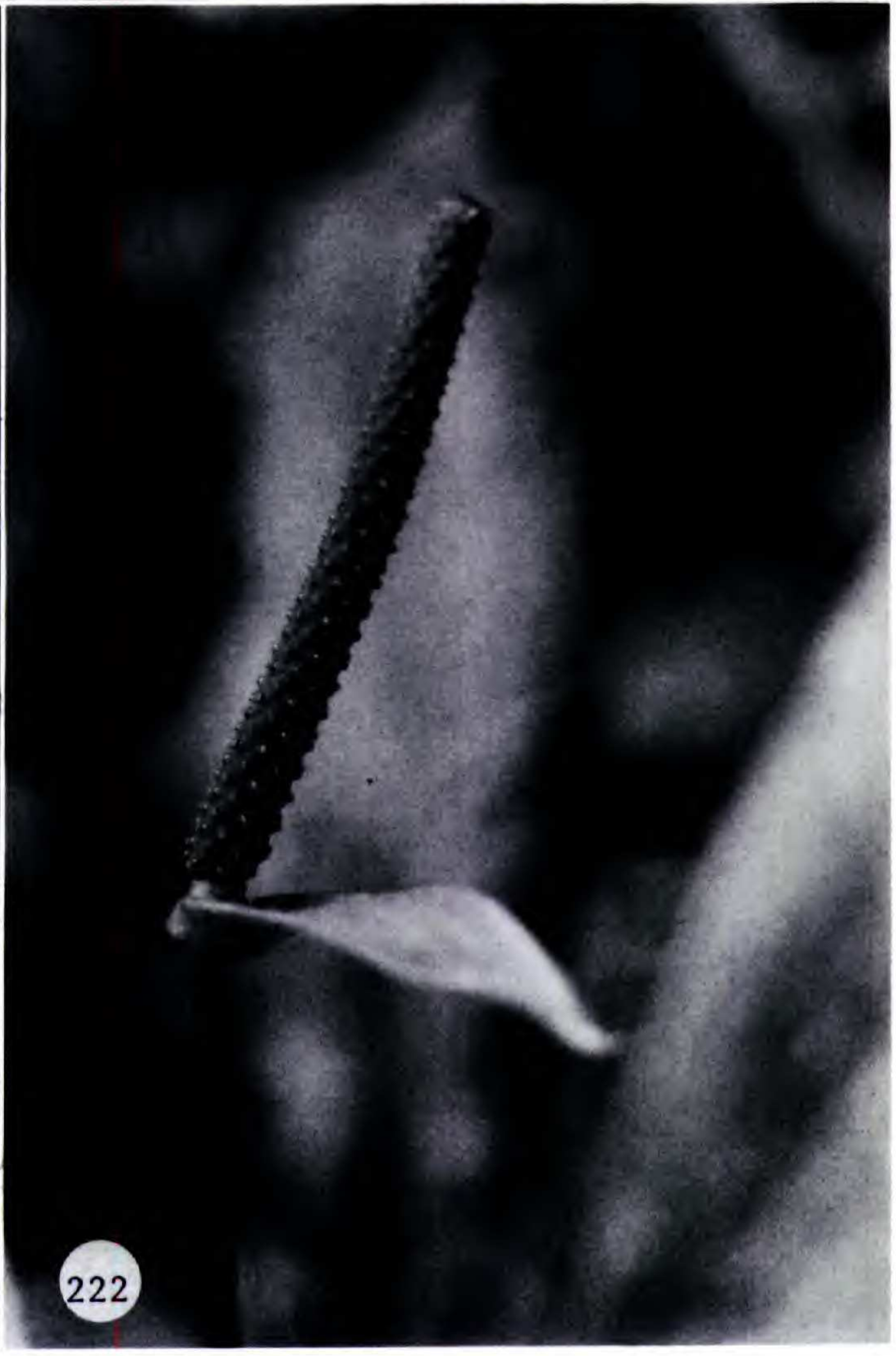
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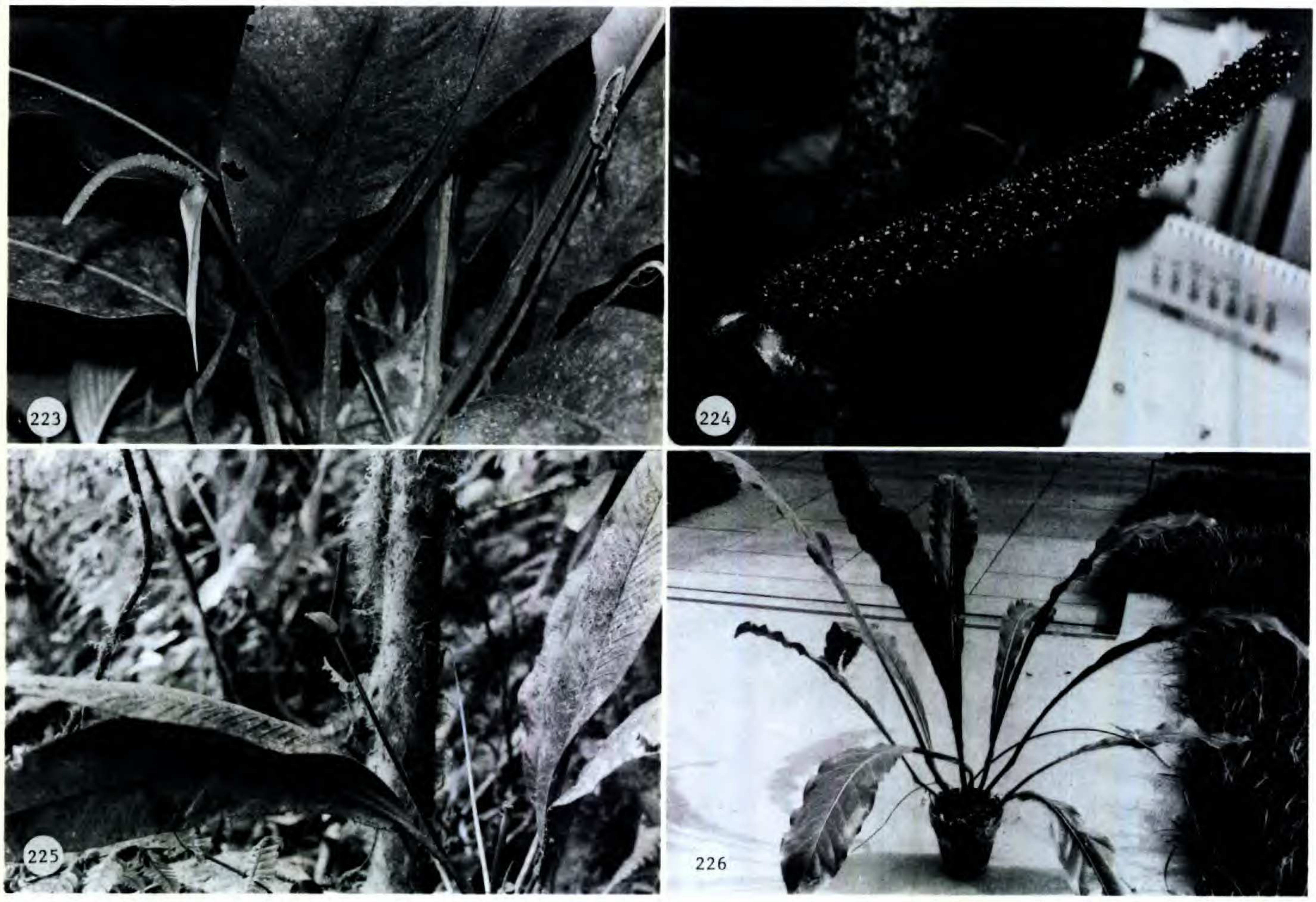

FIGURES 223–226.—223, 224. *Anthurium palequense* Croat, *Croat 38670*.—225. *A. pallatangense* Engl., *Croat 61545*.—226. *A. paraguayense* Engl. var. *paraguayense*, *Beck 3296*.

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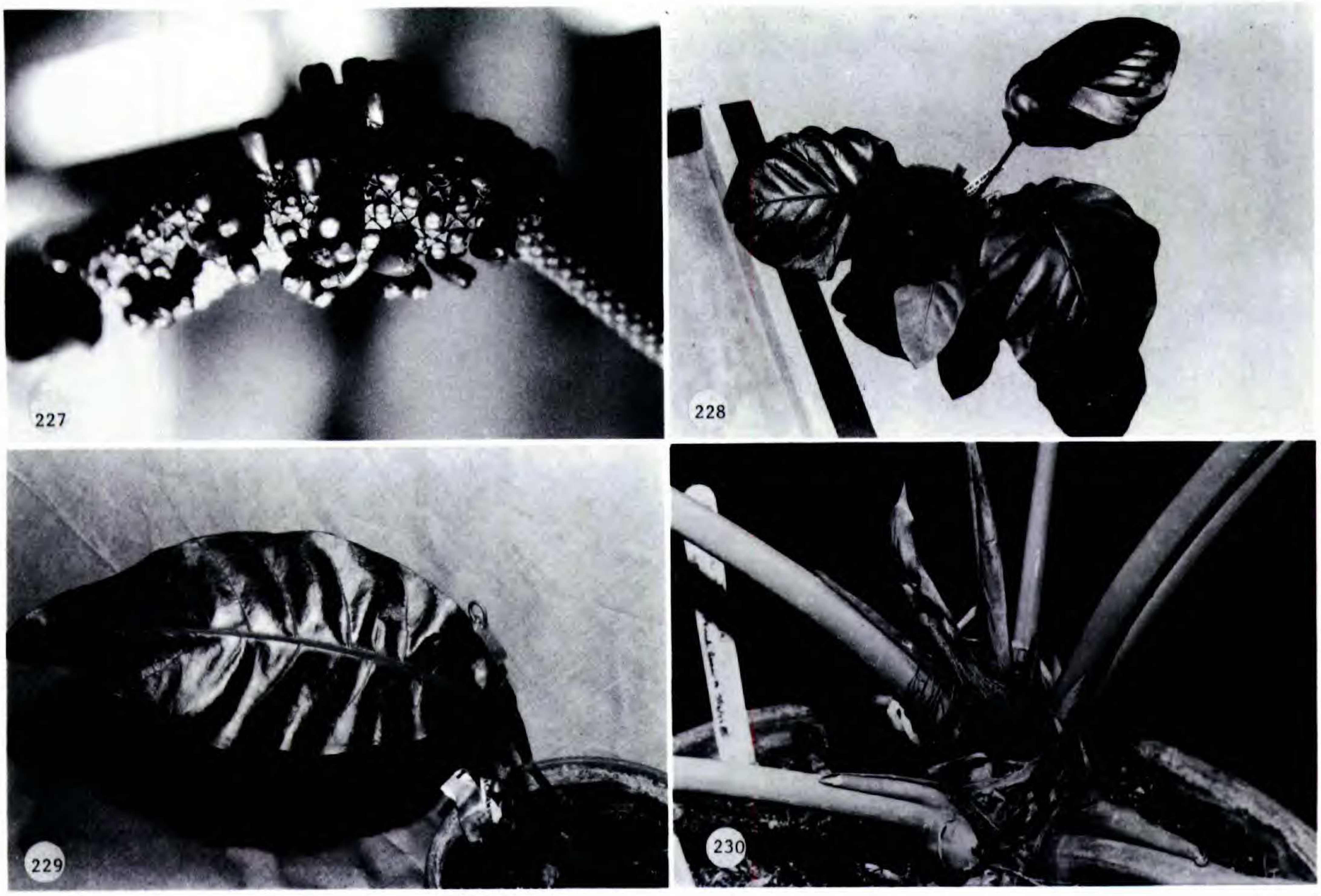
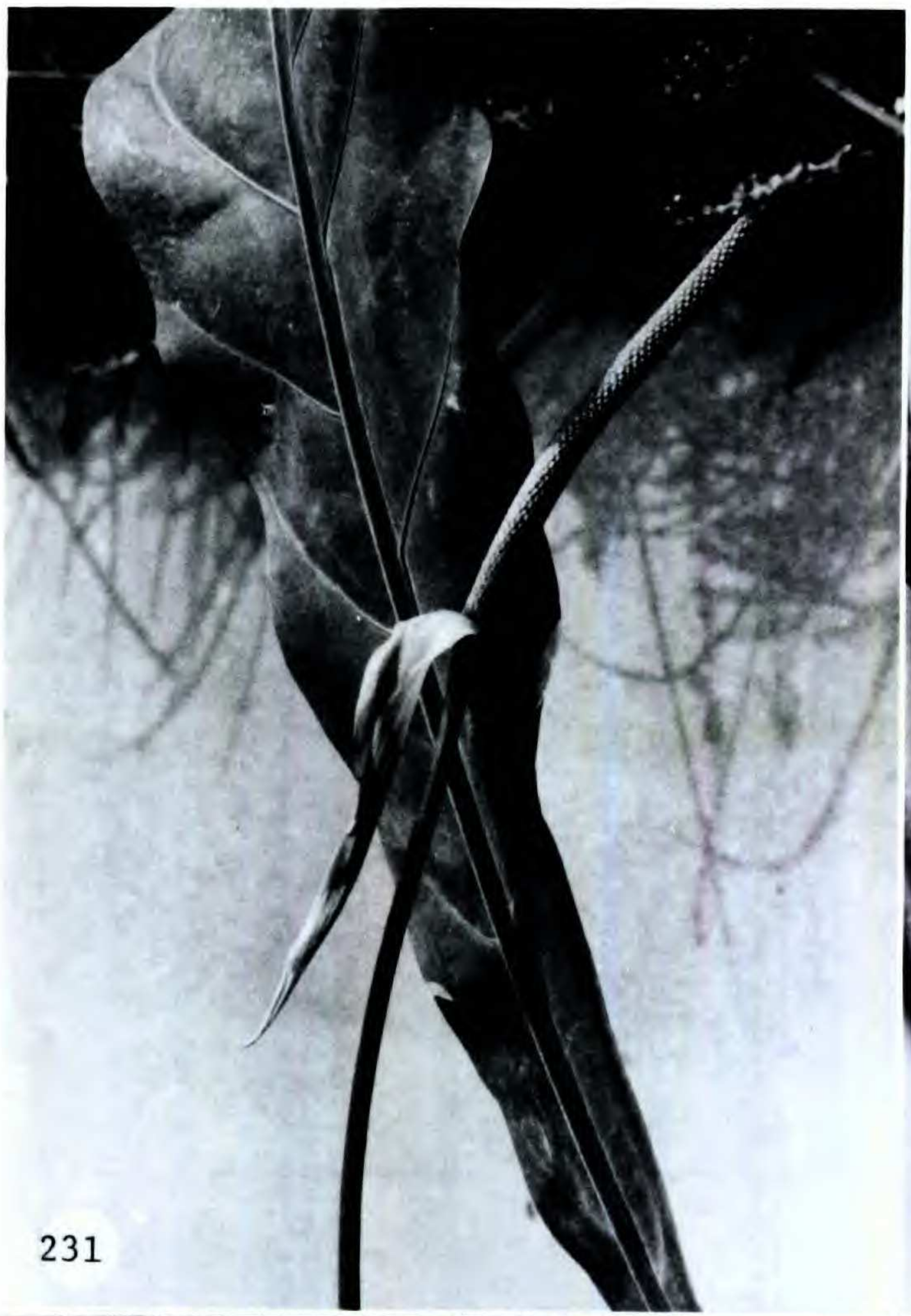
FIGURES 219–222.—219, 220. *Anthurium pachylaminum* Croat, *Croat 58161*.—221. *A. palenquense* Croat, *Croat 38670*.—222. *A. pallatangense* Engl., *Croat 61545*.



FIGURES 227–230.—227. *Anthurium paraguayense* Engl. var. *paraguayense*, *Beck 3296*.—228. *A. paraguayense* Engl. var. *coroicoanum* Croat, *Croat 51657*.—229. *A. paraguayense* Engl. var. *coroicoanum* Croat, *Croat 51704*.—230. *A. pendulifolium* N. E. Br., *Croat 57196*.



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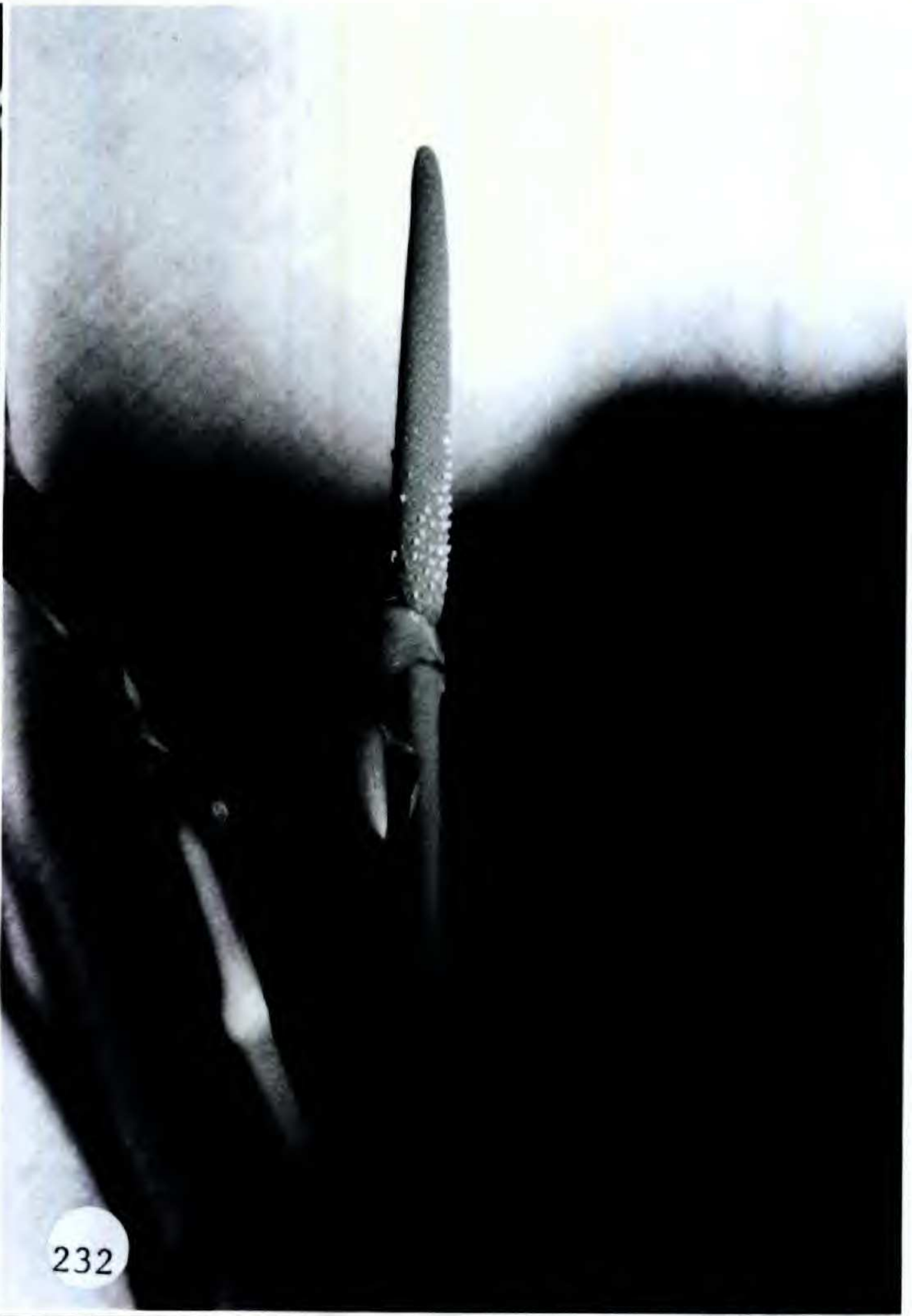

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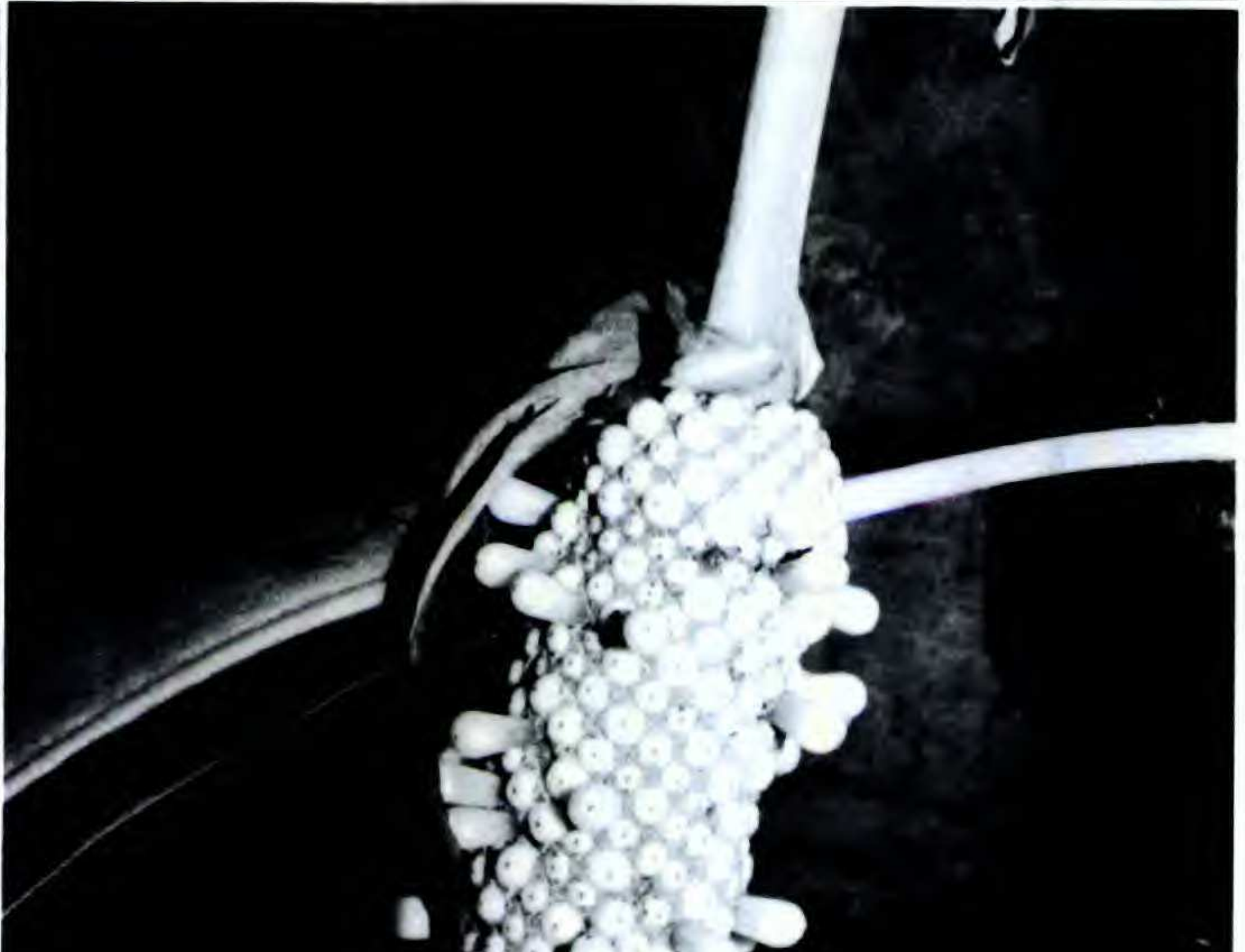

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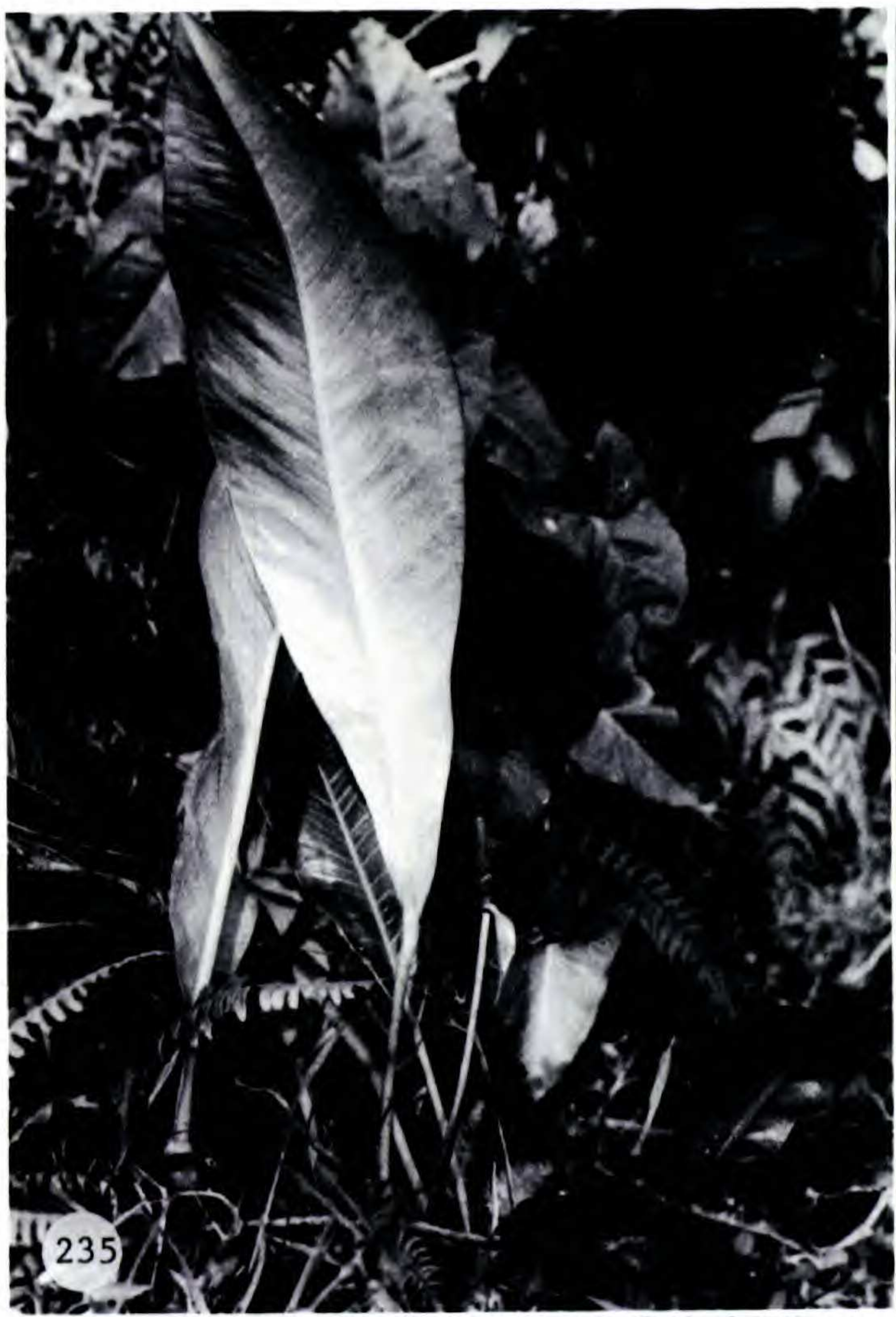
FIGURES 231–234.—231. *Anthurium paraguayense* Engl. var. *paraguayense*, *Beck 3296.*—232. *A. paraguayense* Engl. var. *coroicoanum* Croat, *Croat 51704.*—233. *A. pendulifolium* N. E. Br., *Croat 58610.*—234. *A. pendulifolium* N. E. Br., *Croat 57196.*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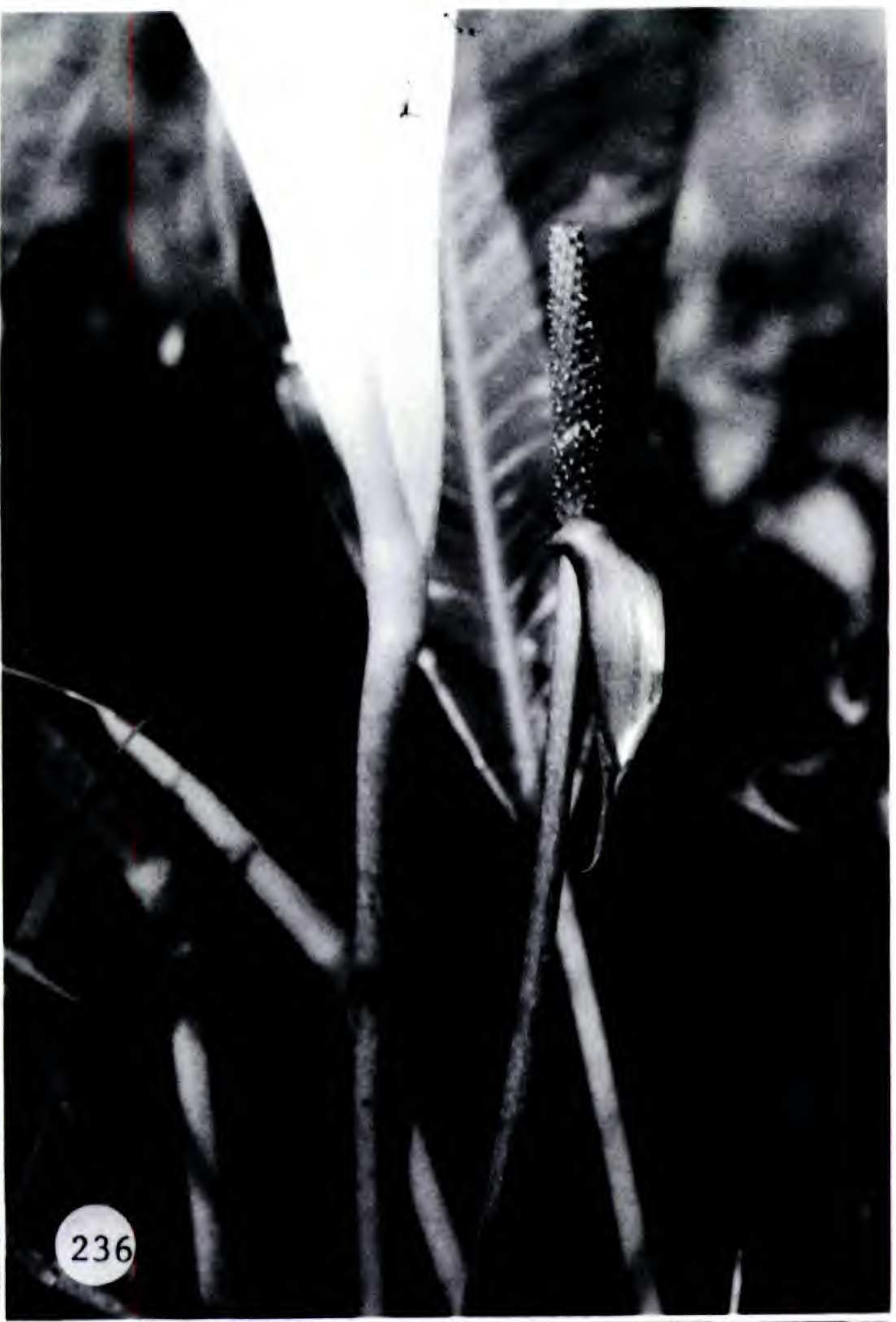
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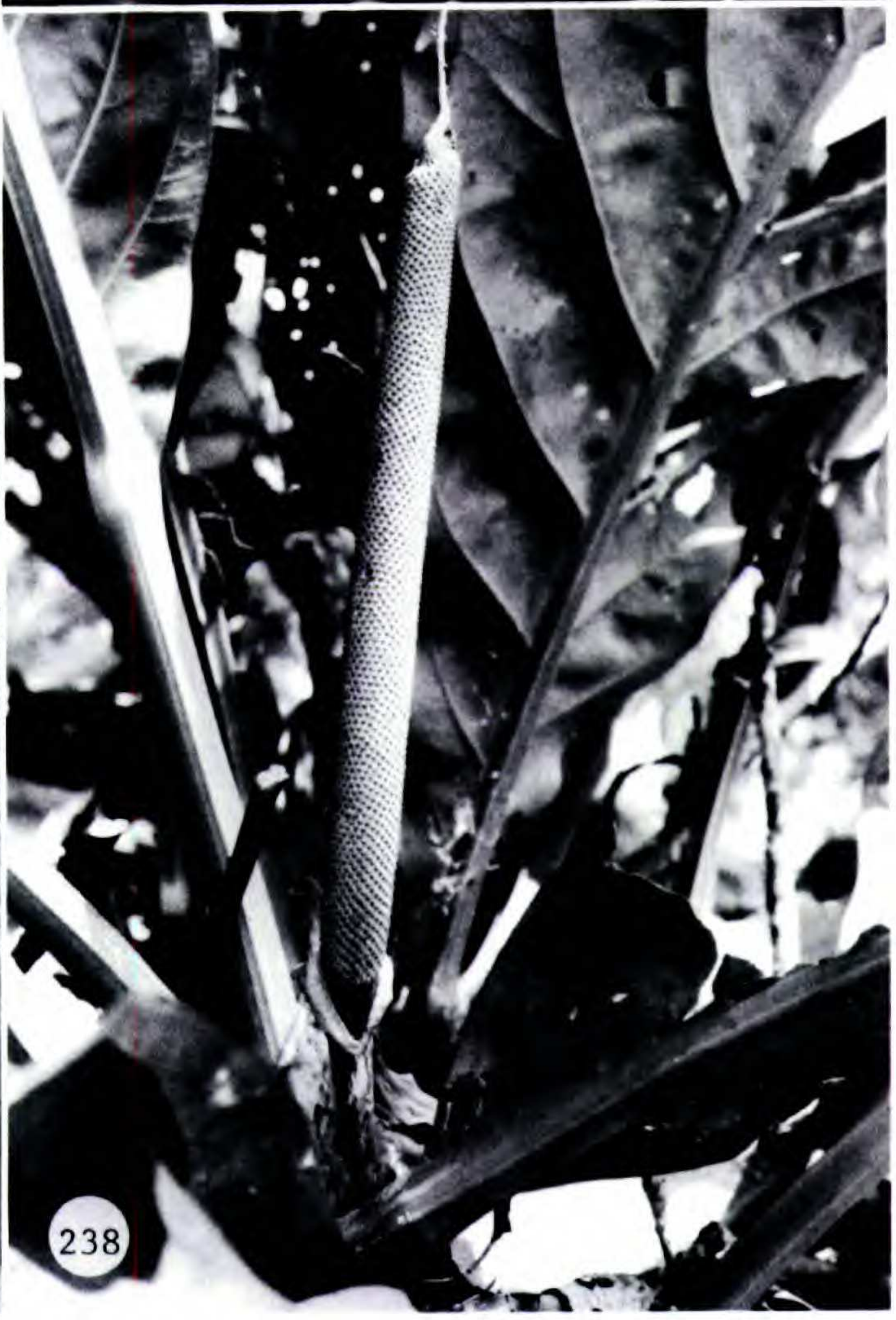
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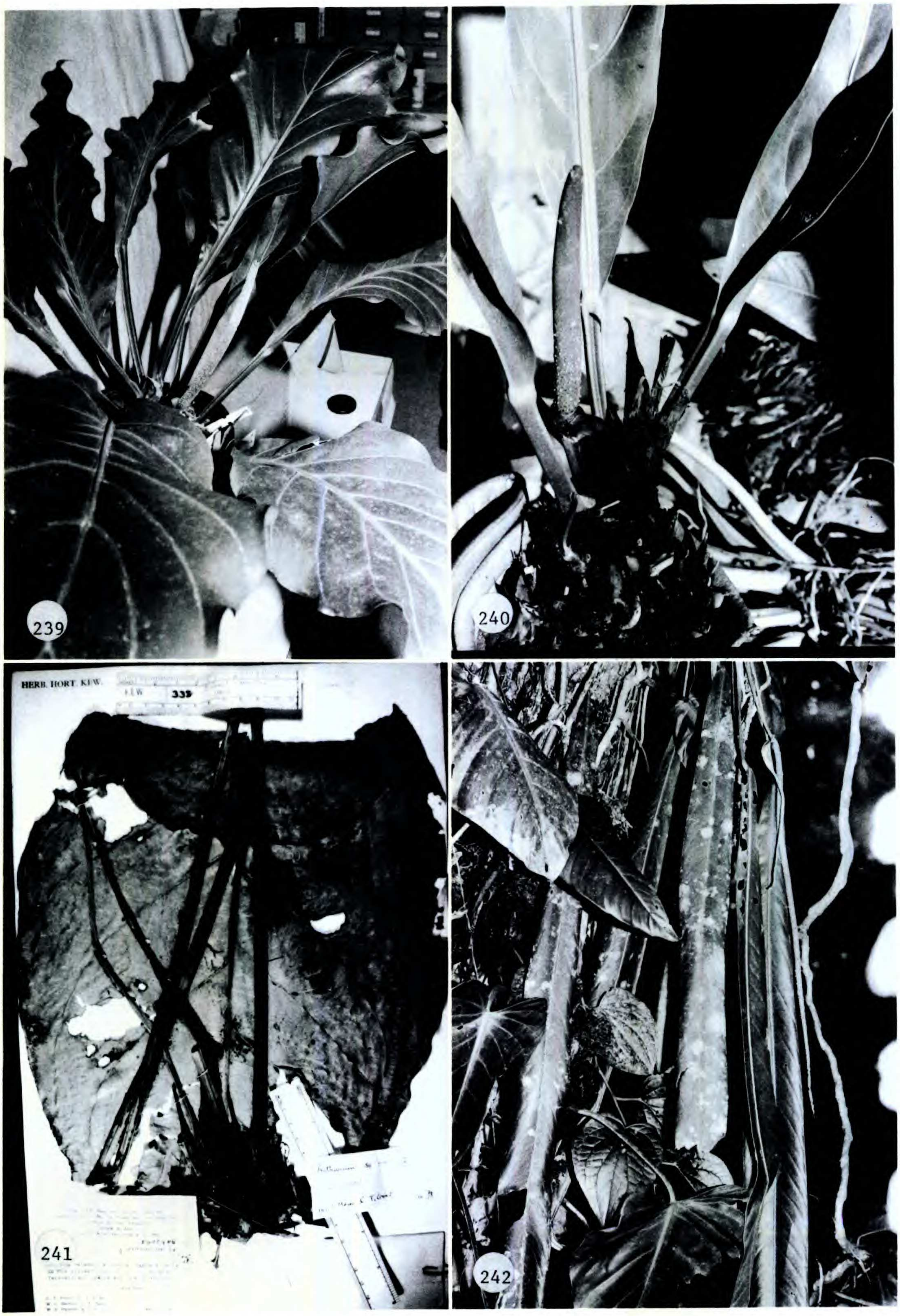
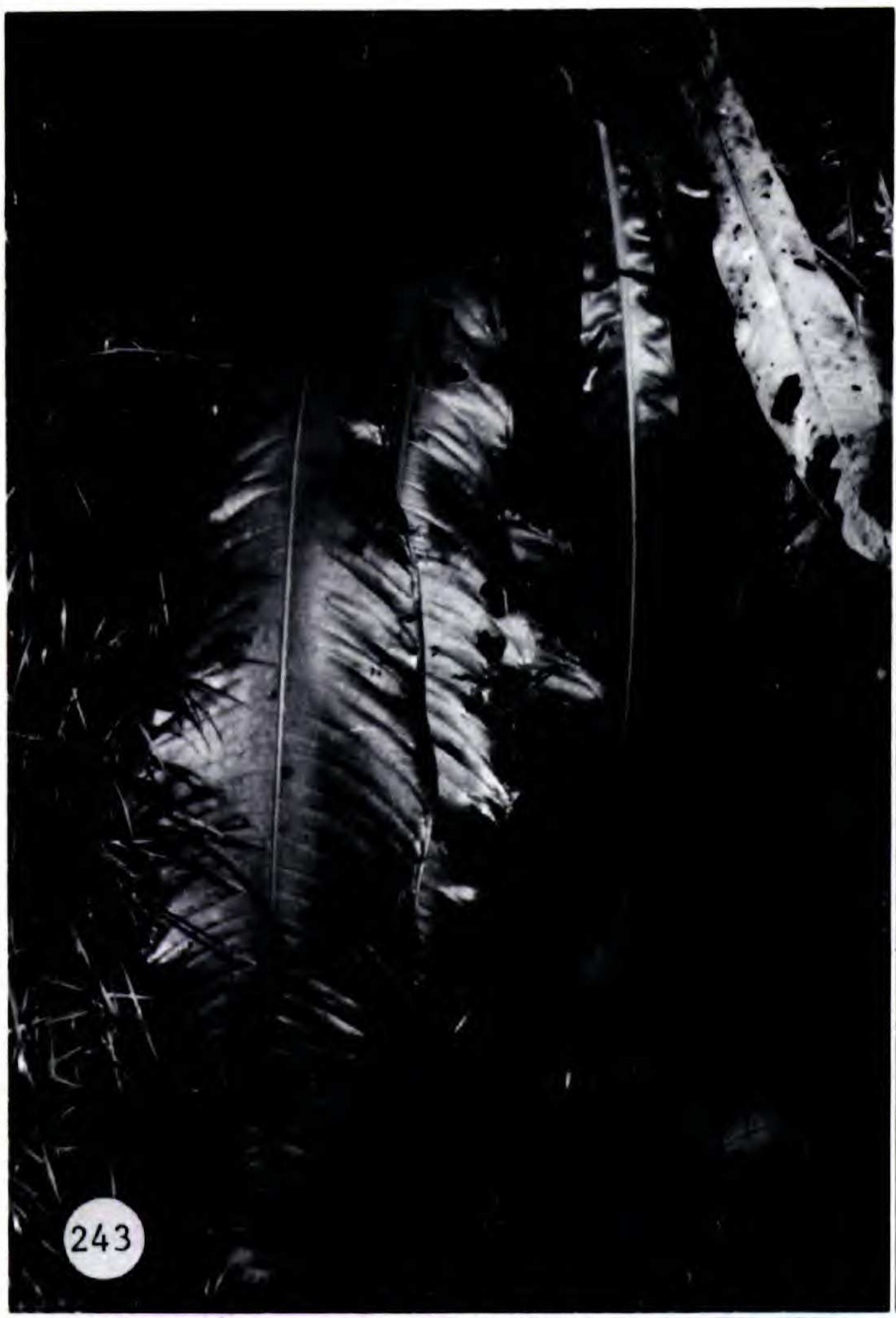
FIGURES 235–238.—235, 236. *Anthurium penningtonii* Croat, *Croat 49439.*—237, 238. *A. plowmanii* Croat, *Croat 53563.*



FIGURES 239–242.—239. *Anthurium plowmanii* Croat, *Croat 53542*,, cultivated by F. Fuchs, Homestead, Florida.—240. *A. plowmanii* Croat, *Croat 53701*.—241. *A. pranceanum* Croat, *Prance et al. 12640*.—242. *A. prolatum* Croat & R. A. Baker, *Croat 46979*.



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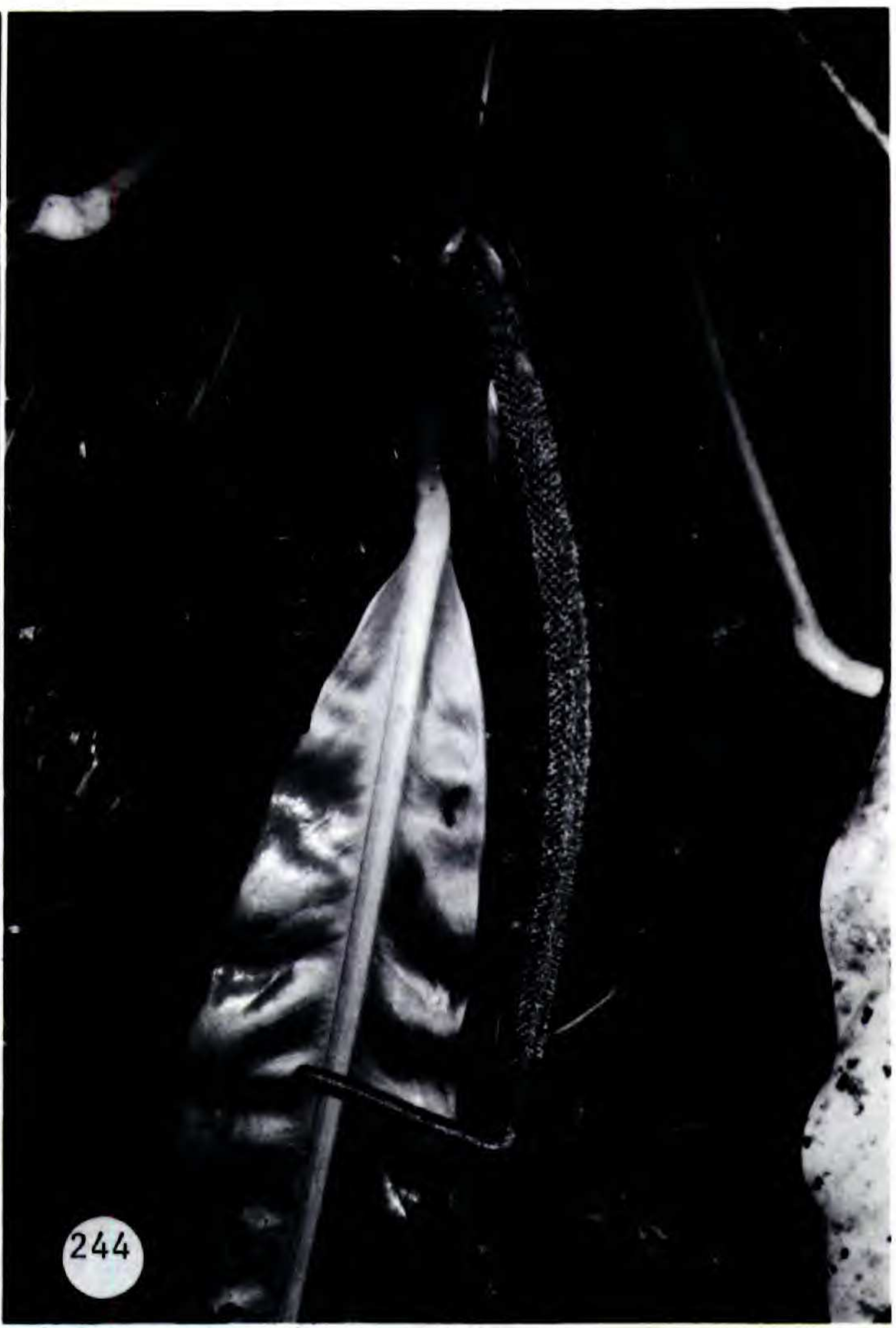

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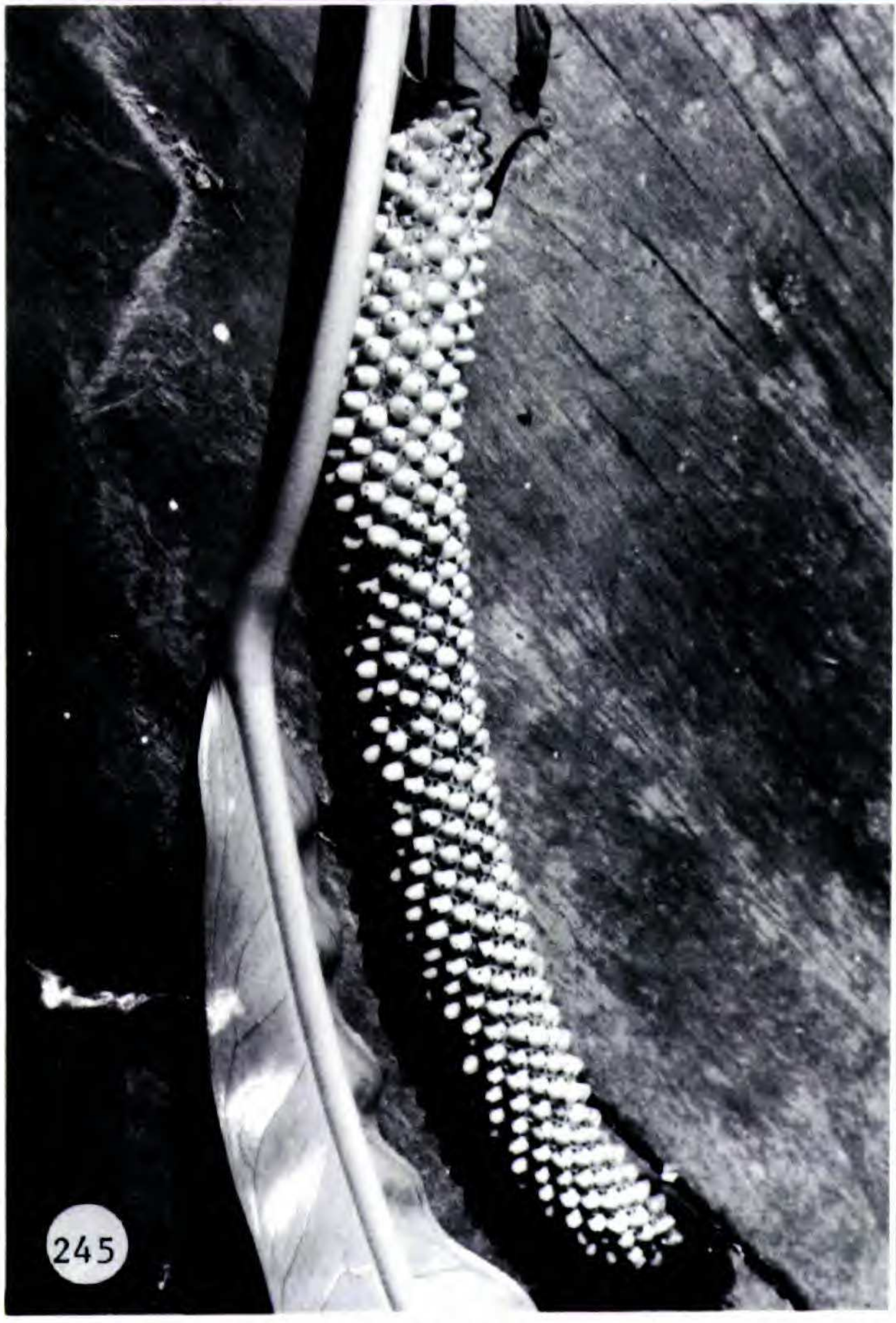

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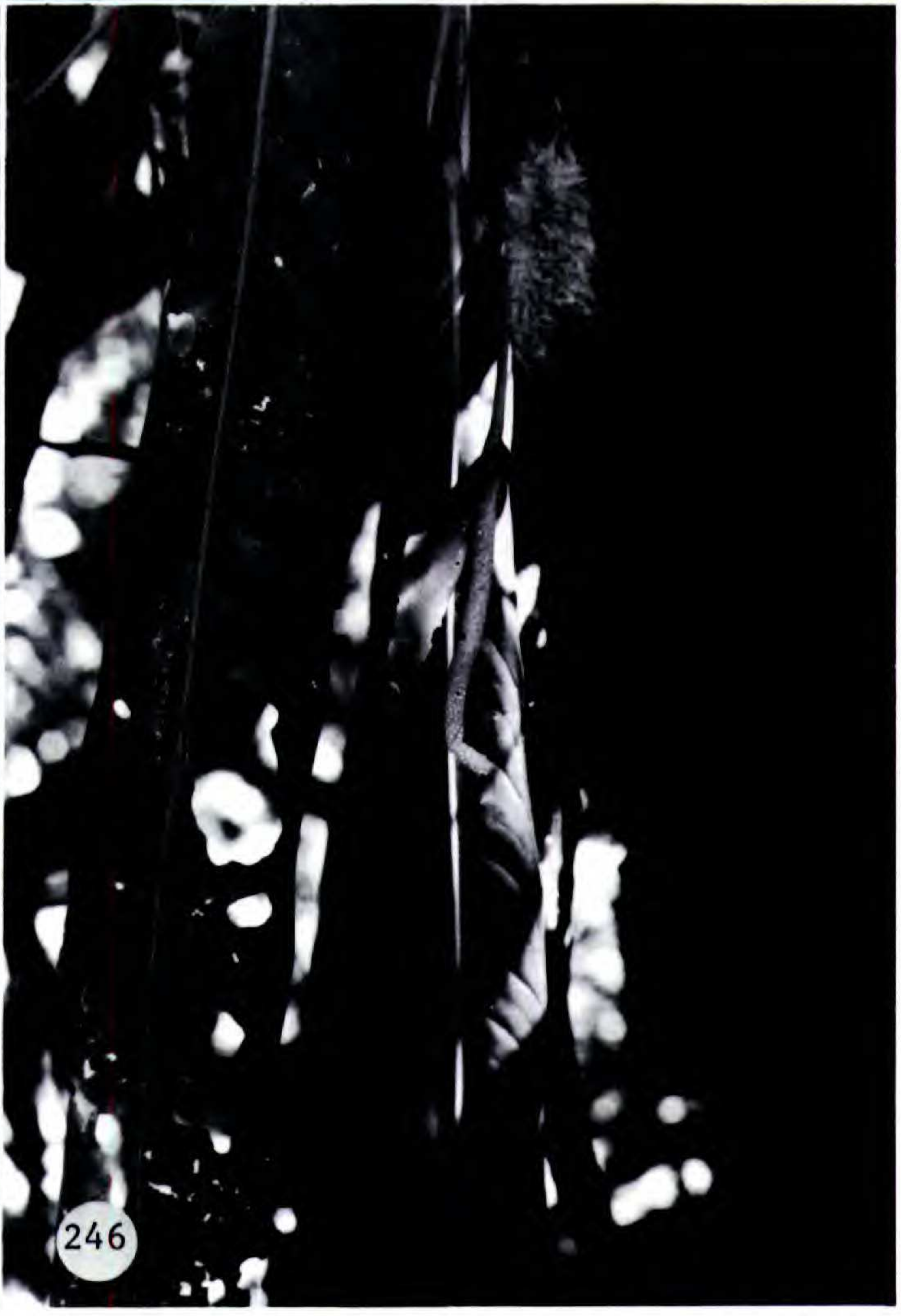

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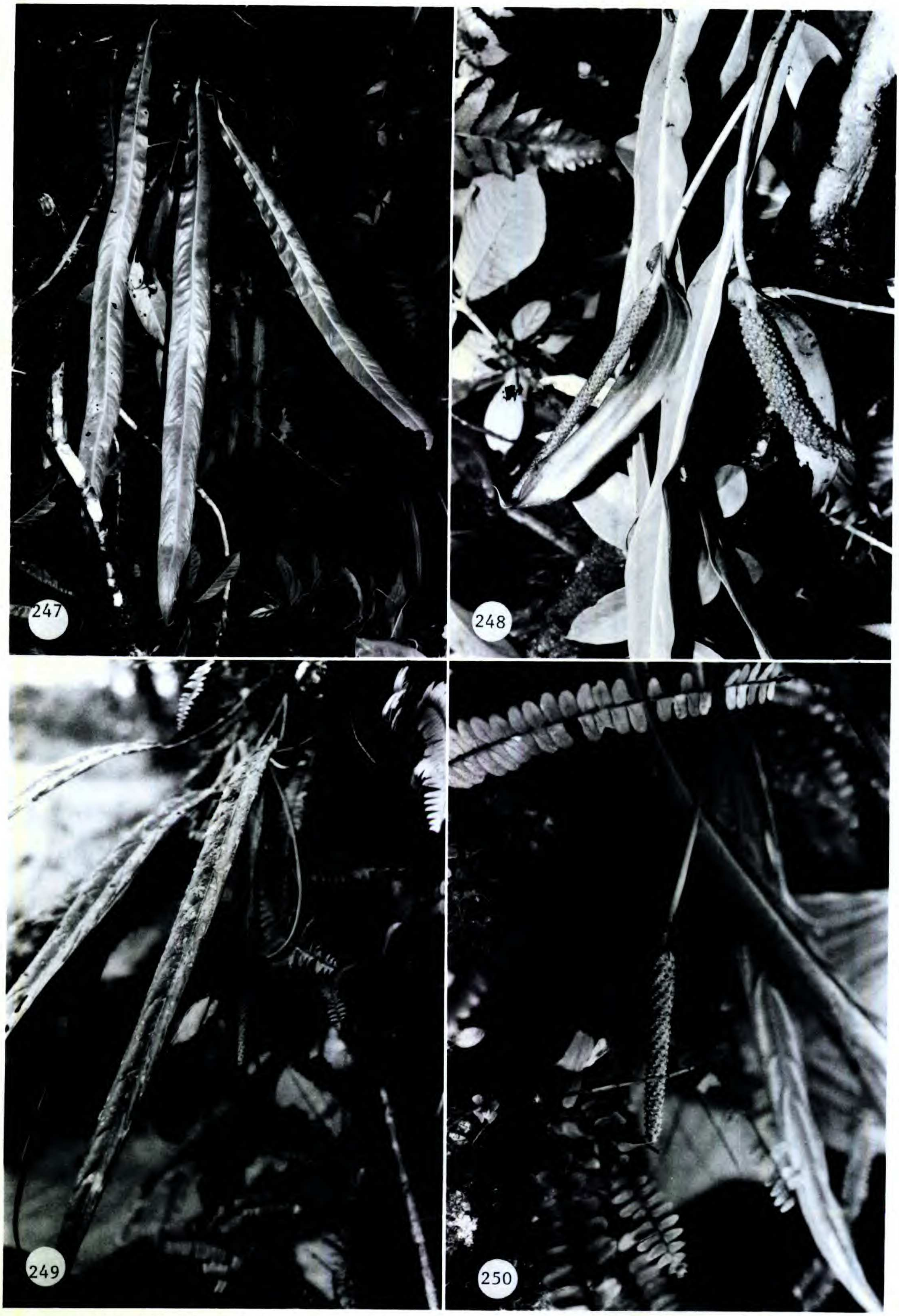
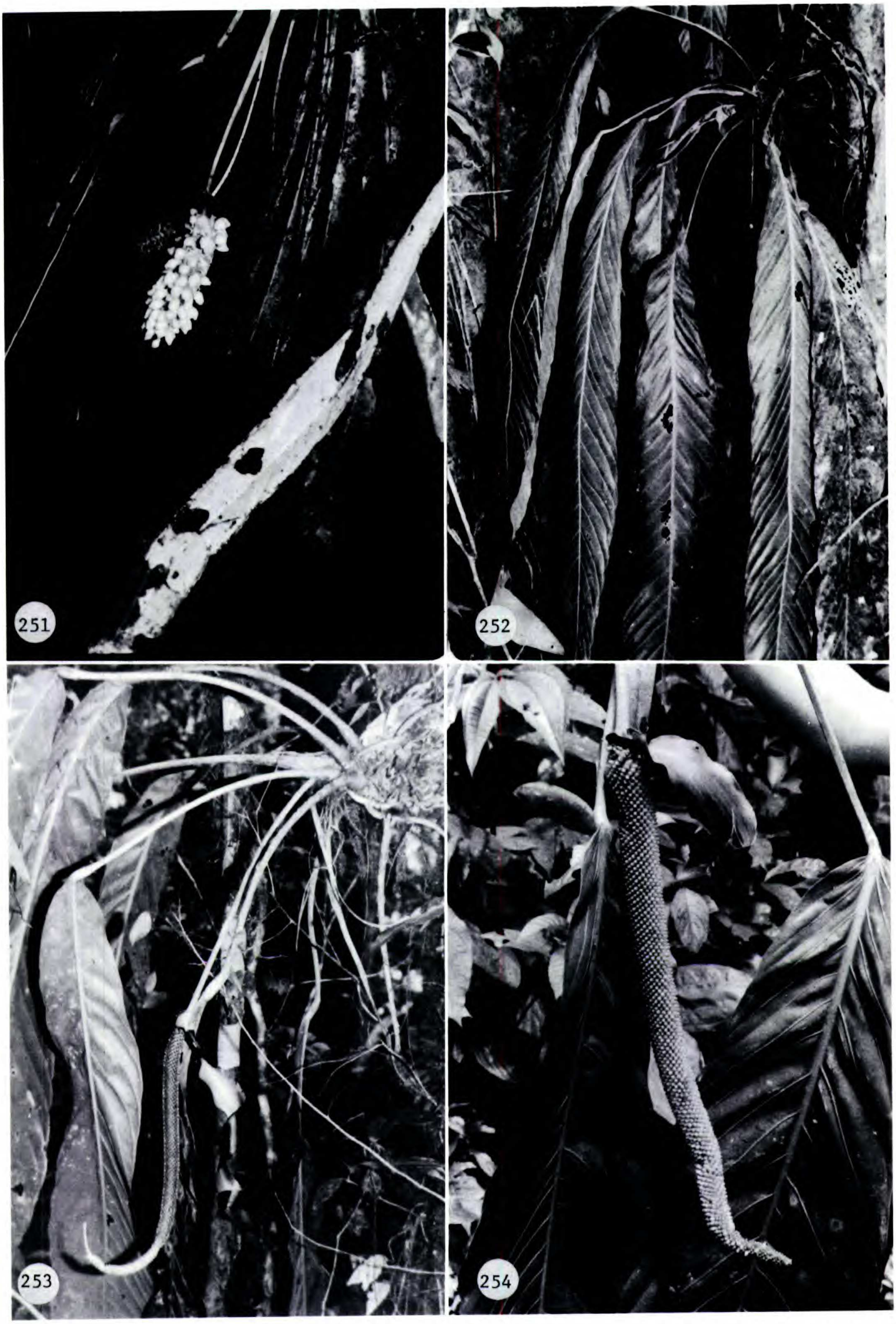
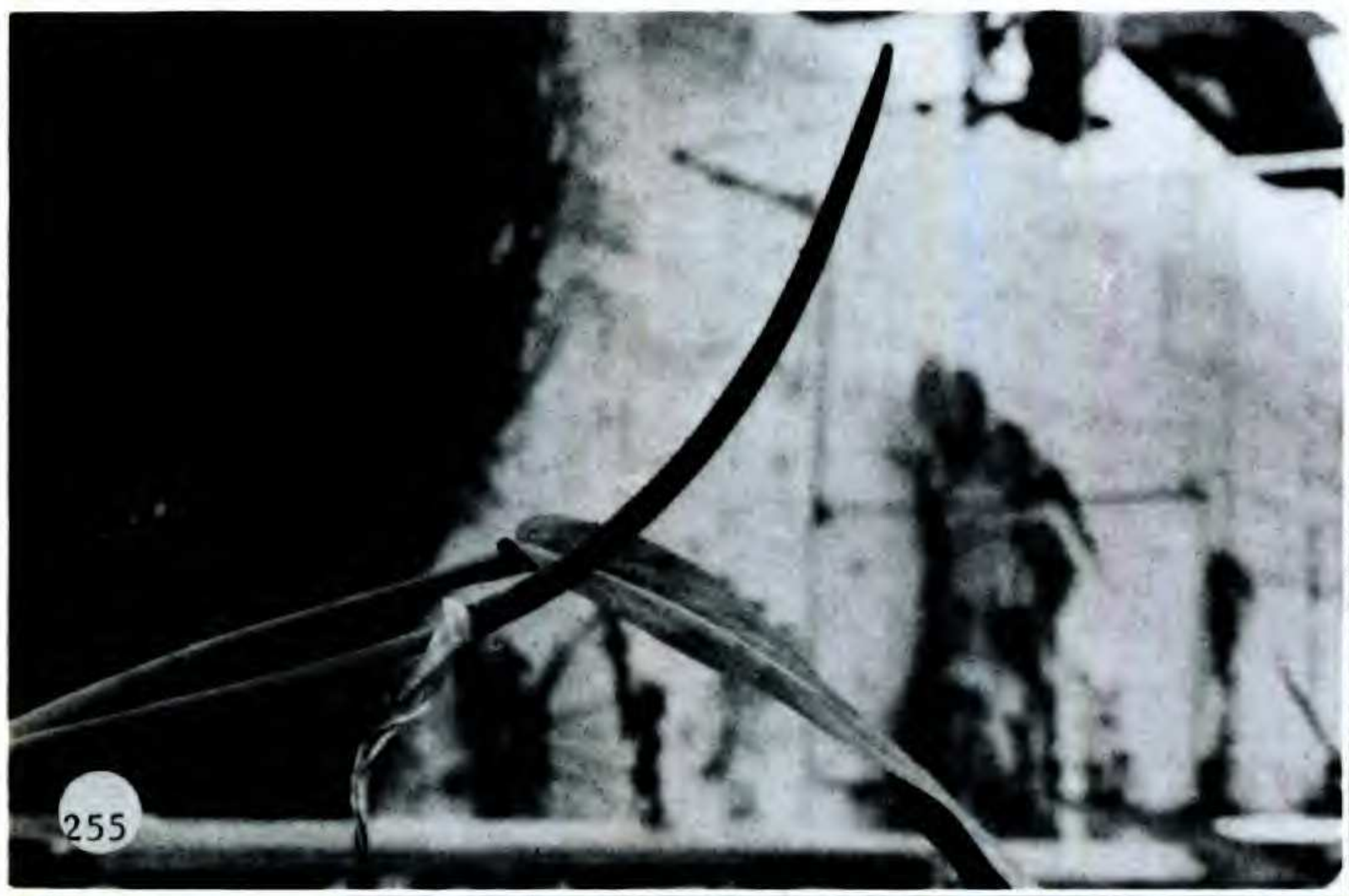
FIGURES 243–246.—243, 244. *Anthurium prolatum* Croat & R. A. Baker, cultivated at Las Cruces Bot. Gard.—245. *A. prolatum* Croat & R. A. Baker, *Croat 47087*.—246. *A. protensum* Schott subsp. *protensum*, *Croat 44501*.



FIGURES 247–250.—247, 248. *Anthurium protensum* Schott subsp. *protensum*, Costa Rica: Braulio Carrillo National Park (not collected).—249, 250. *A. protensum* Schott subsp. *arcuatum* Croat, *Croat 60077*.



FIGURES 251–254.—251. *Anthurium protensum* Schott subsp. *arcuatum* Croat, *Croat 48964*.—252. *A. pseudospectabile* Croat, *Croat 48674*.—253. *A. pseudospectabile* Croat, *Croat 48777*.—254. *A. pseudospectabile* Croat, *Croat 66592*.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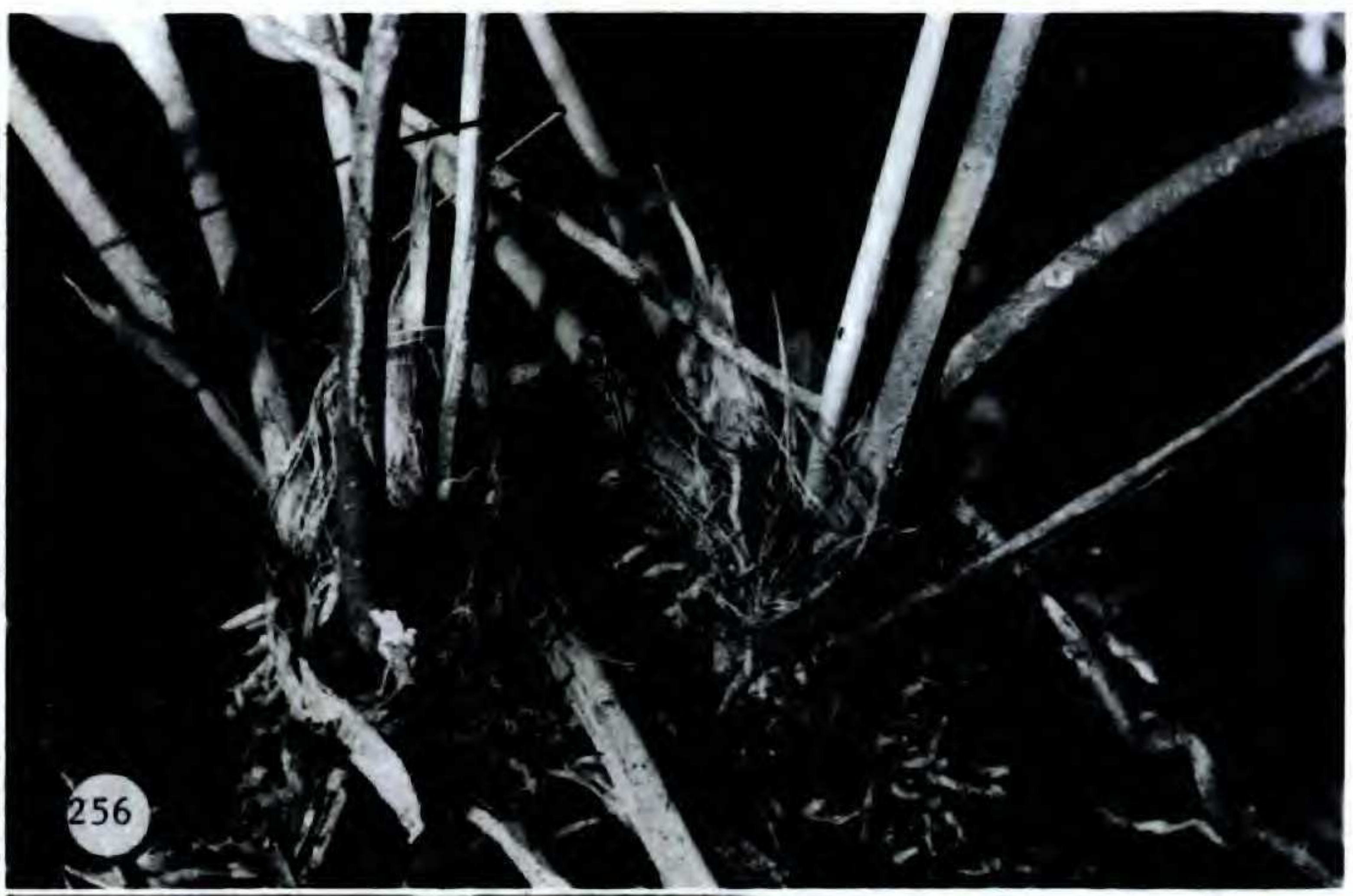
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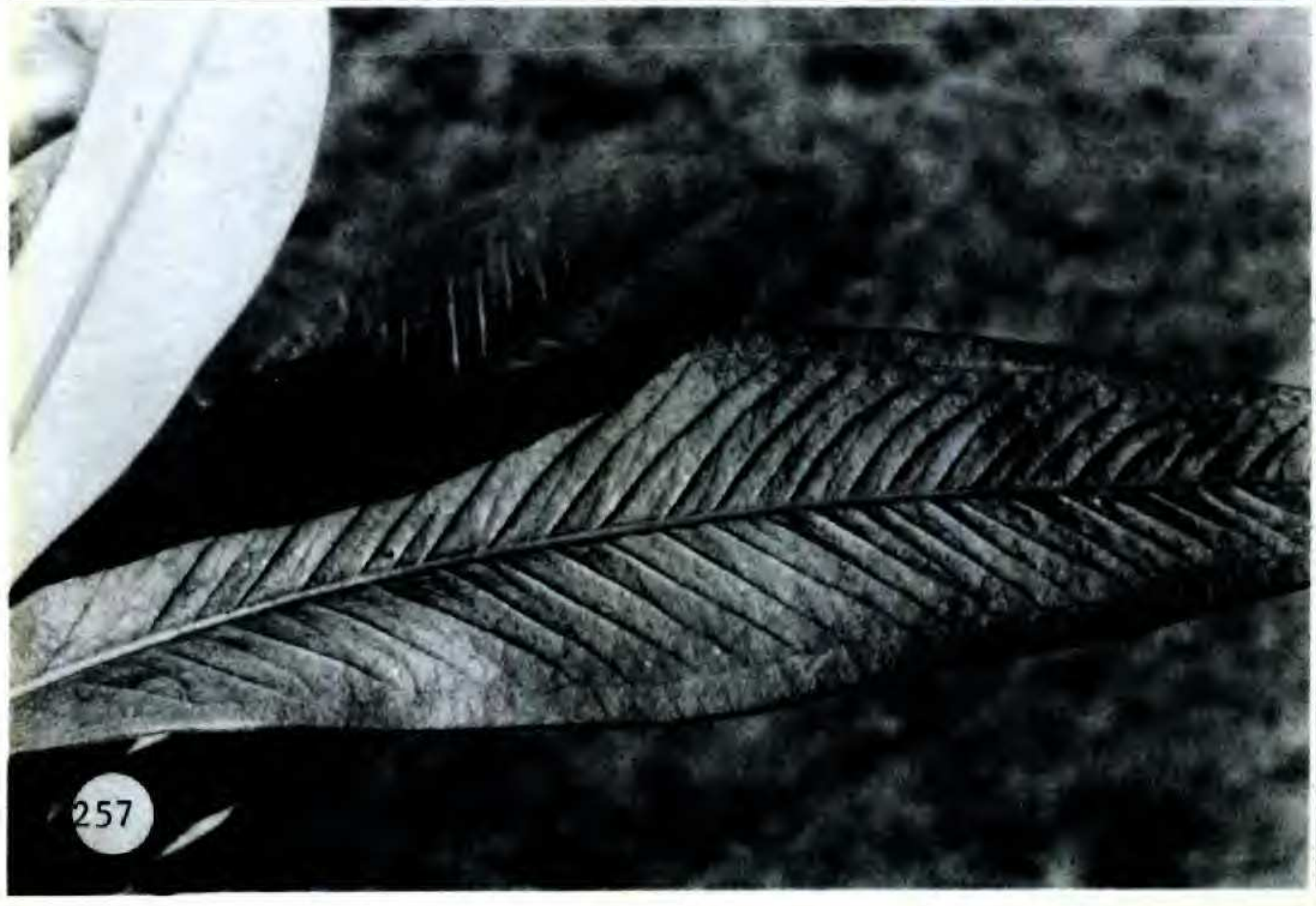
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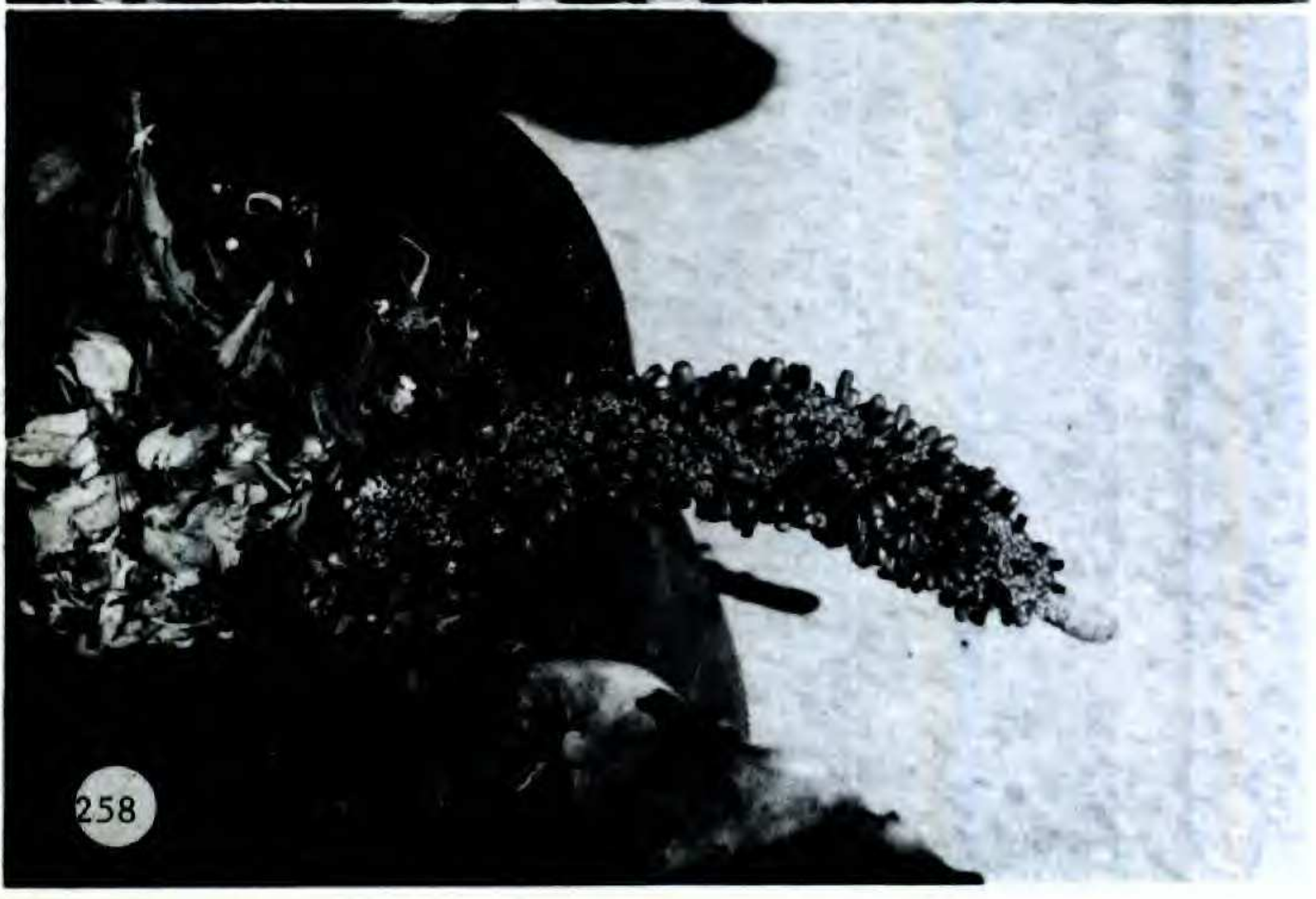
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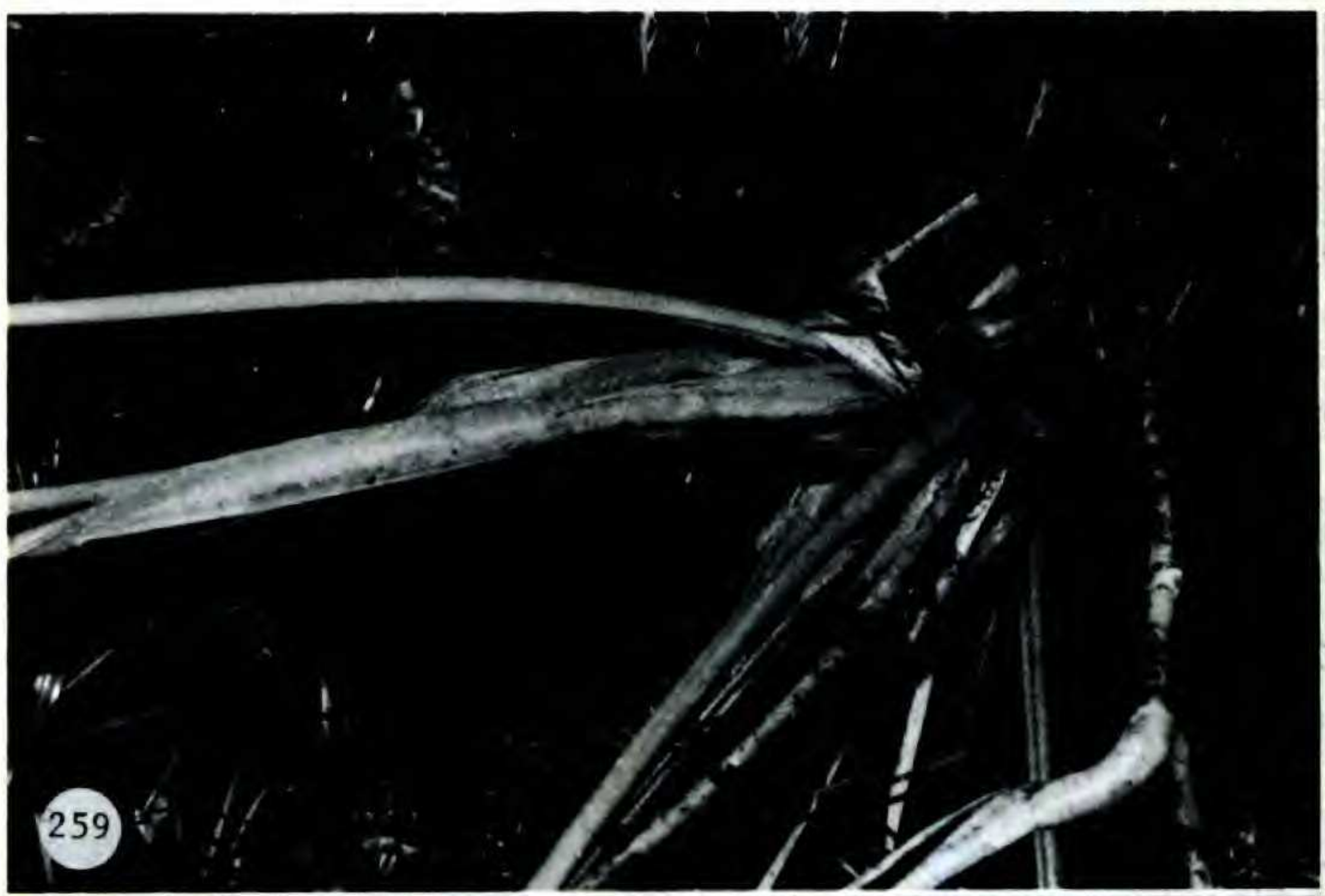
FIGURES 255-258.—255. *Anthurium pendulifolium* N. E. Br., *Croat 57196.*—256. *A. penningtonii* Croat, *Croat 49439.*—257. *A. penningtonii* Croat, *Croat 58215.*—258. *A. plowmanii* Croat, *Croat 53542.*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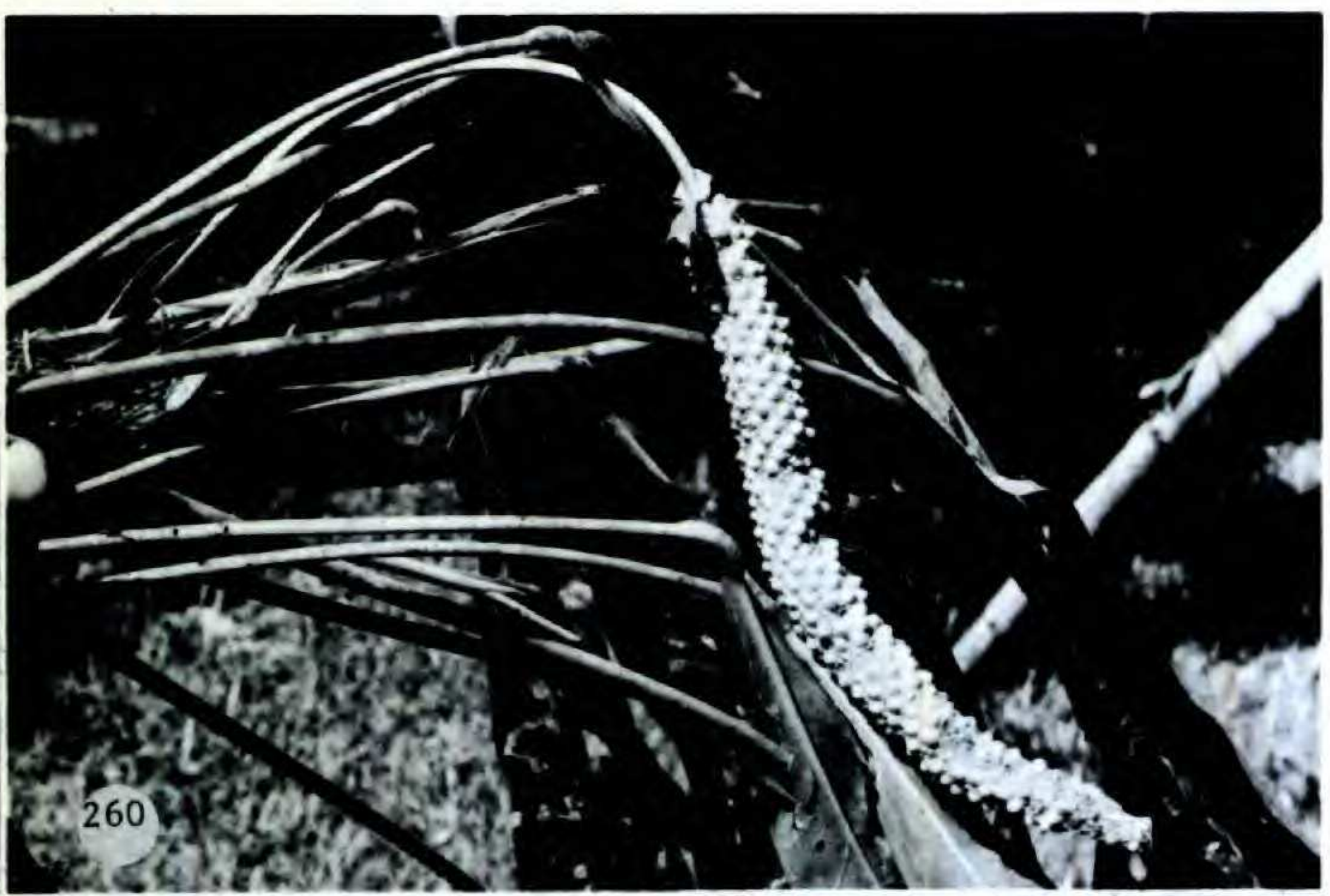
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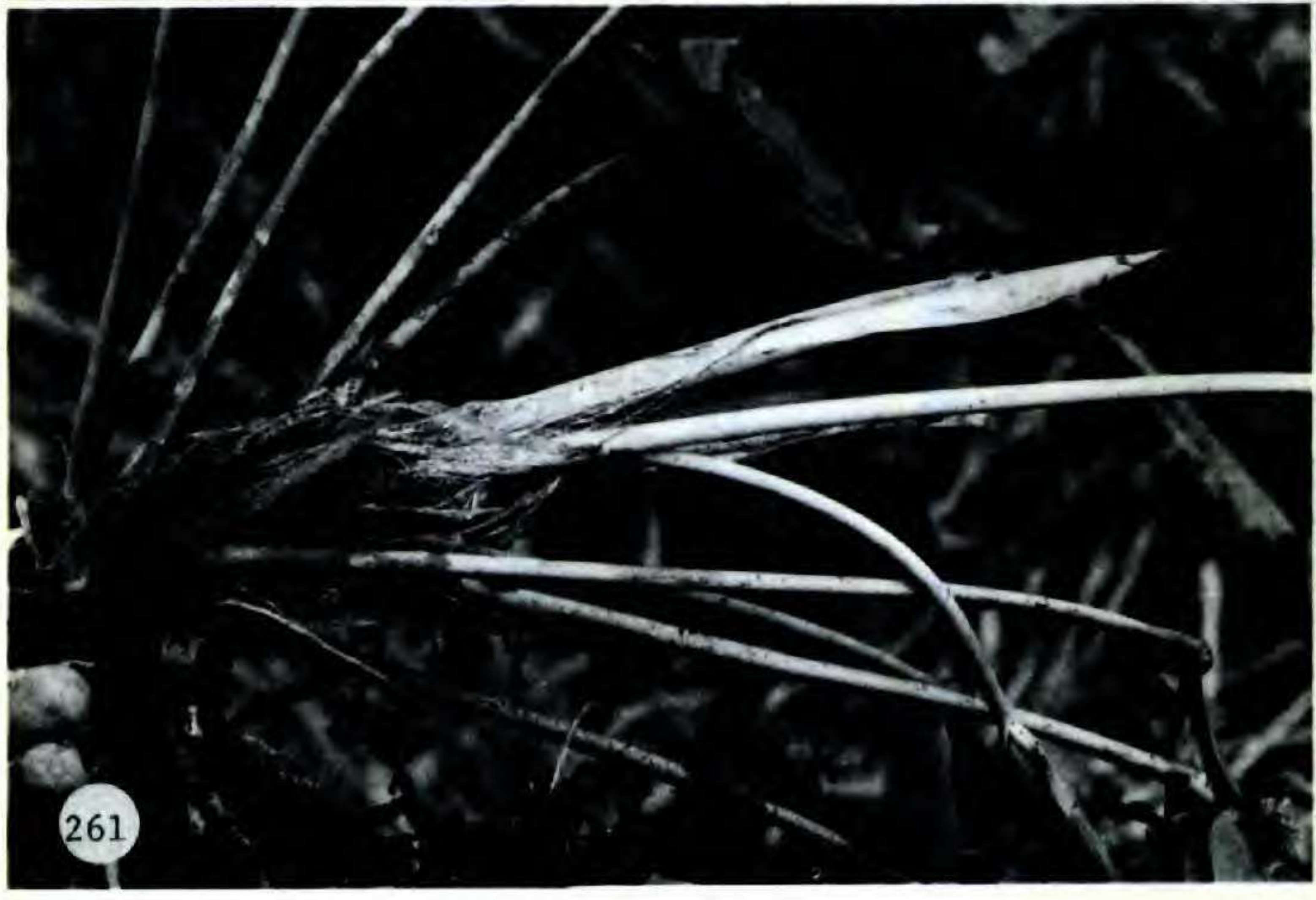
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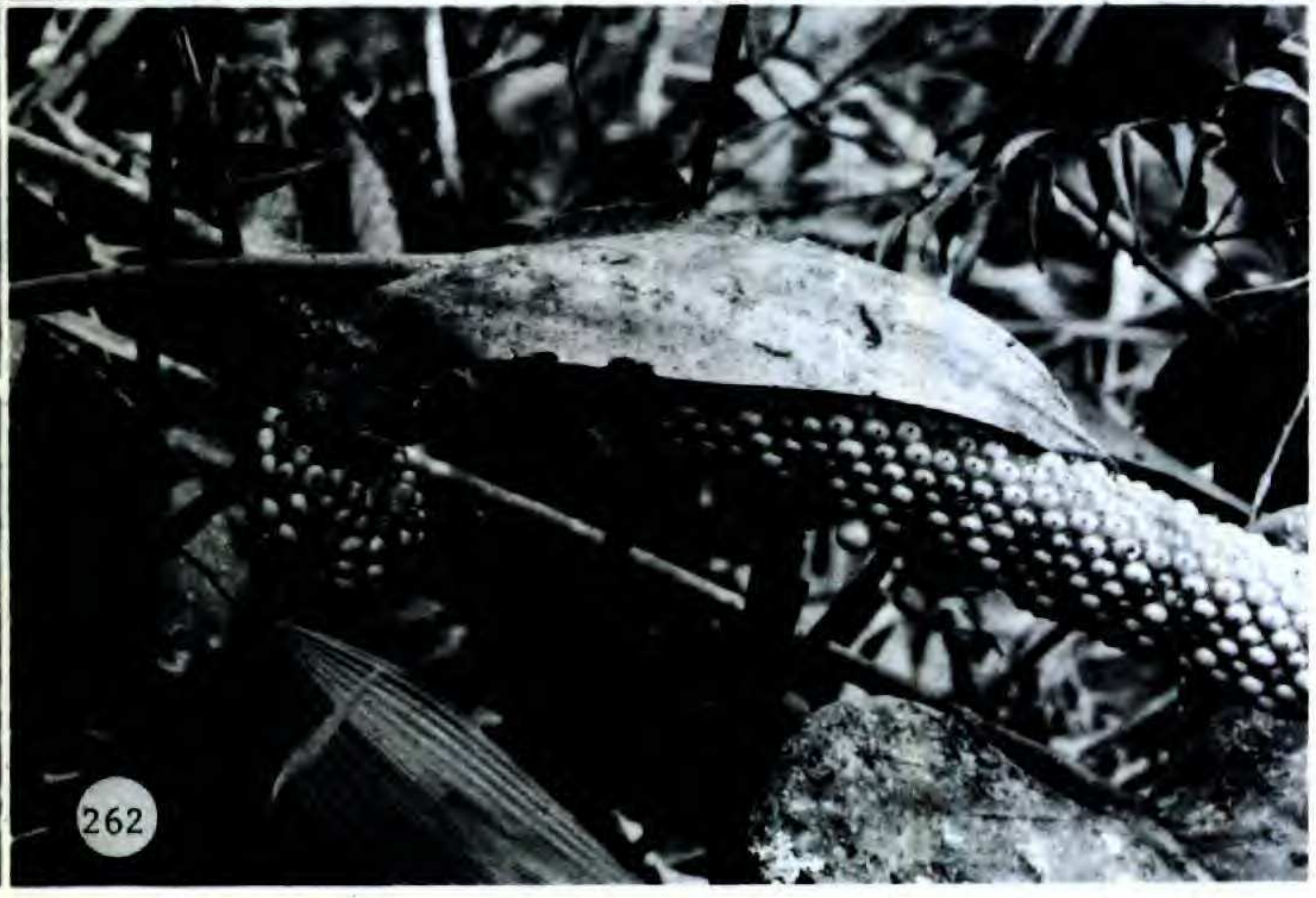
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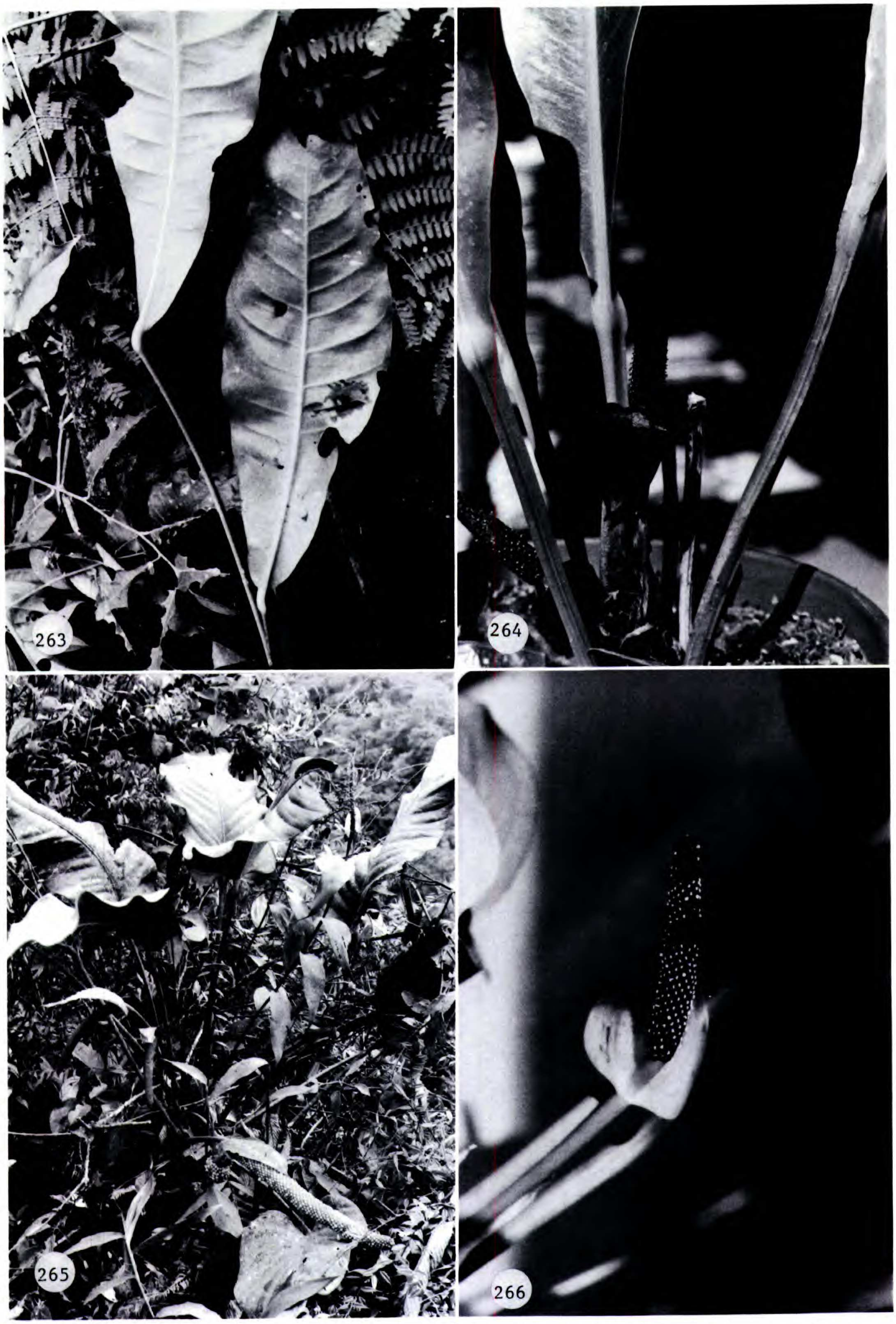
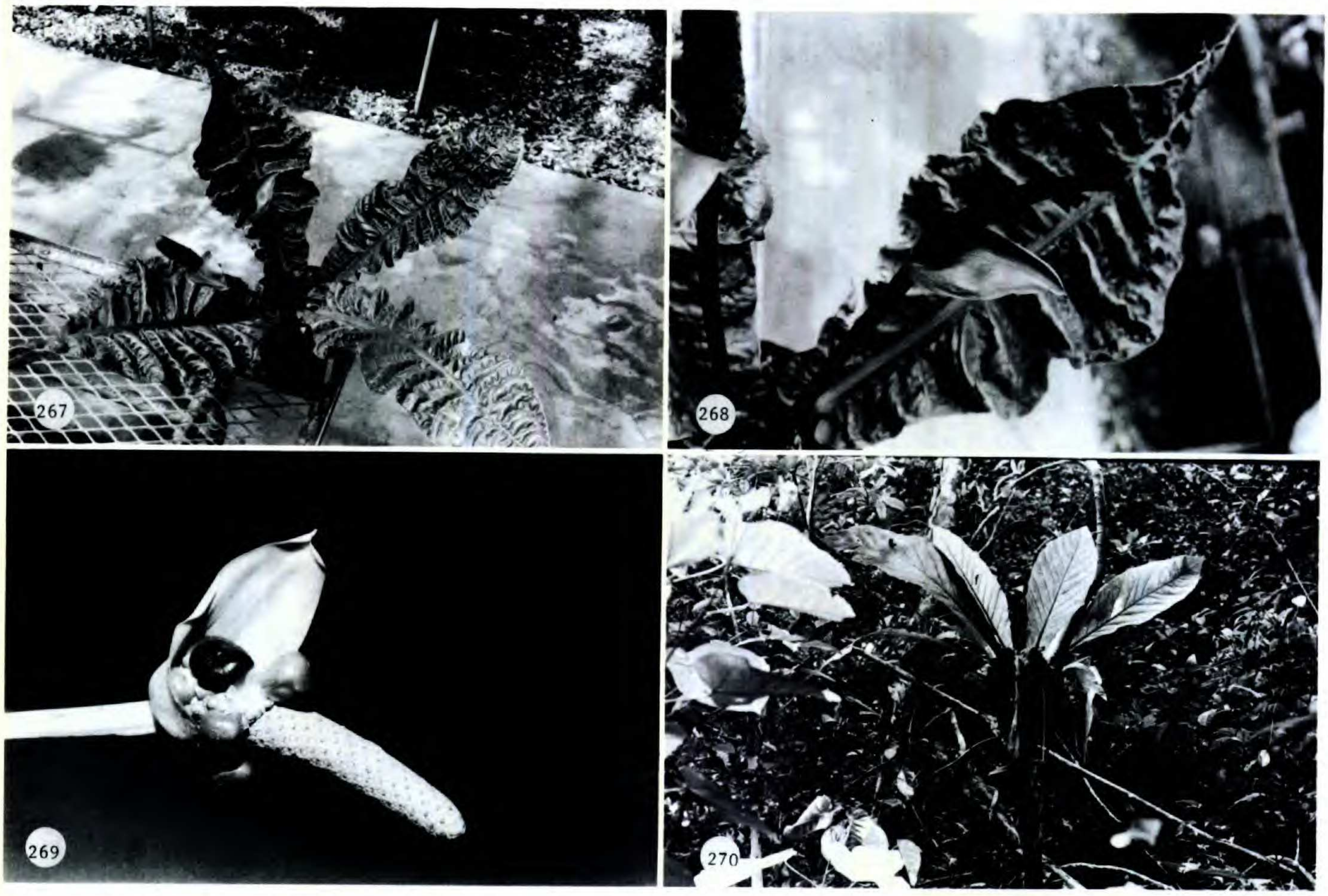
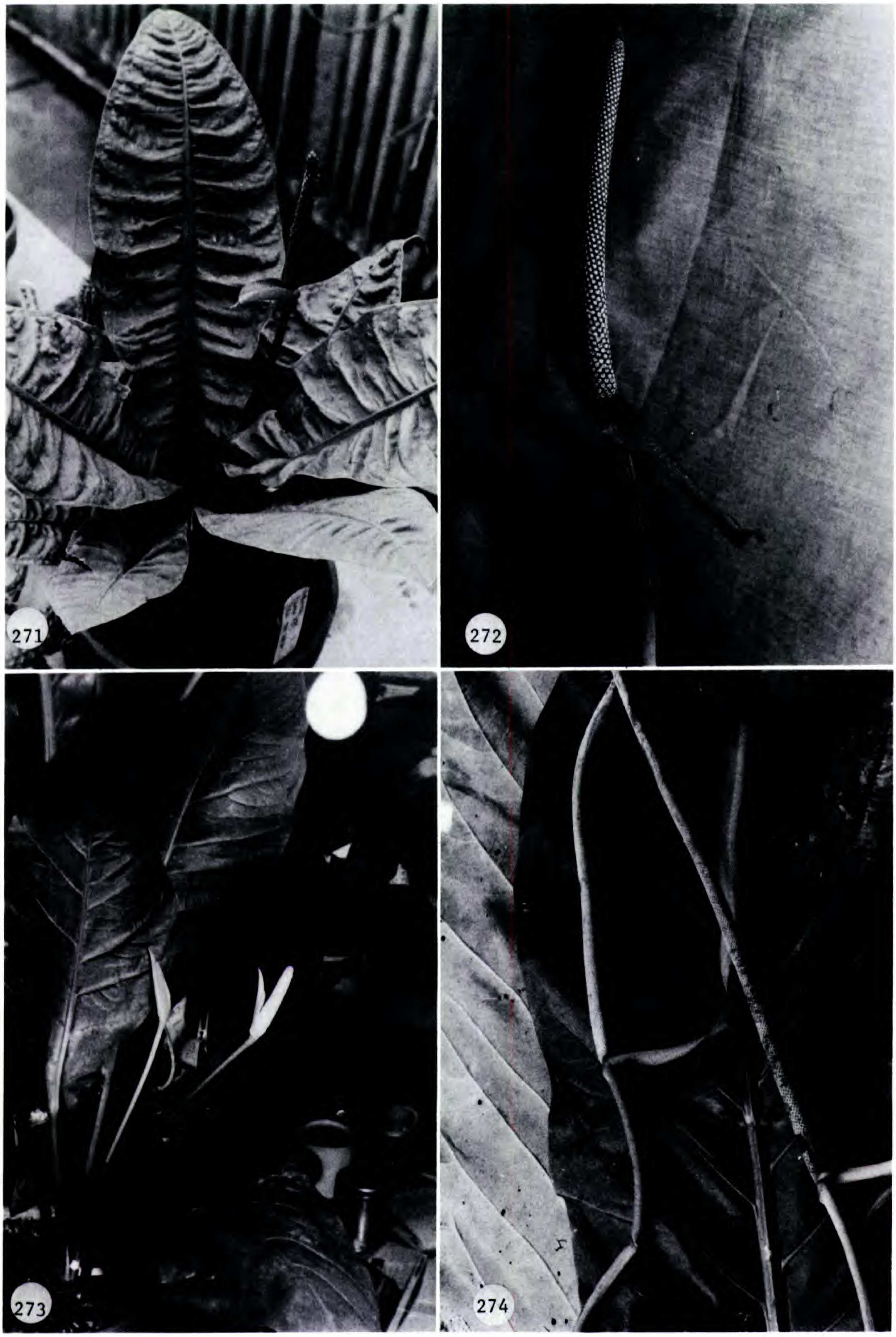
FIGURES 259-262.—259. *Anthurium prolatum* Croat & R. A. Baker, cultivated at Las Cruces Bot. Gard.—260, 261. *A. protensum* Schott subsp. *protensum, Croat 36714.*—262. *A. ranchoanum* Engl., *Croat 36053.*



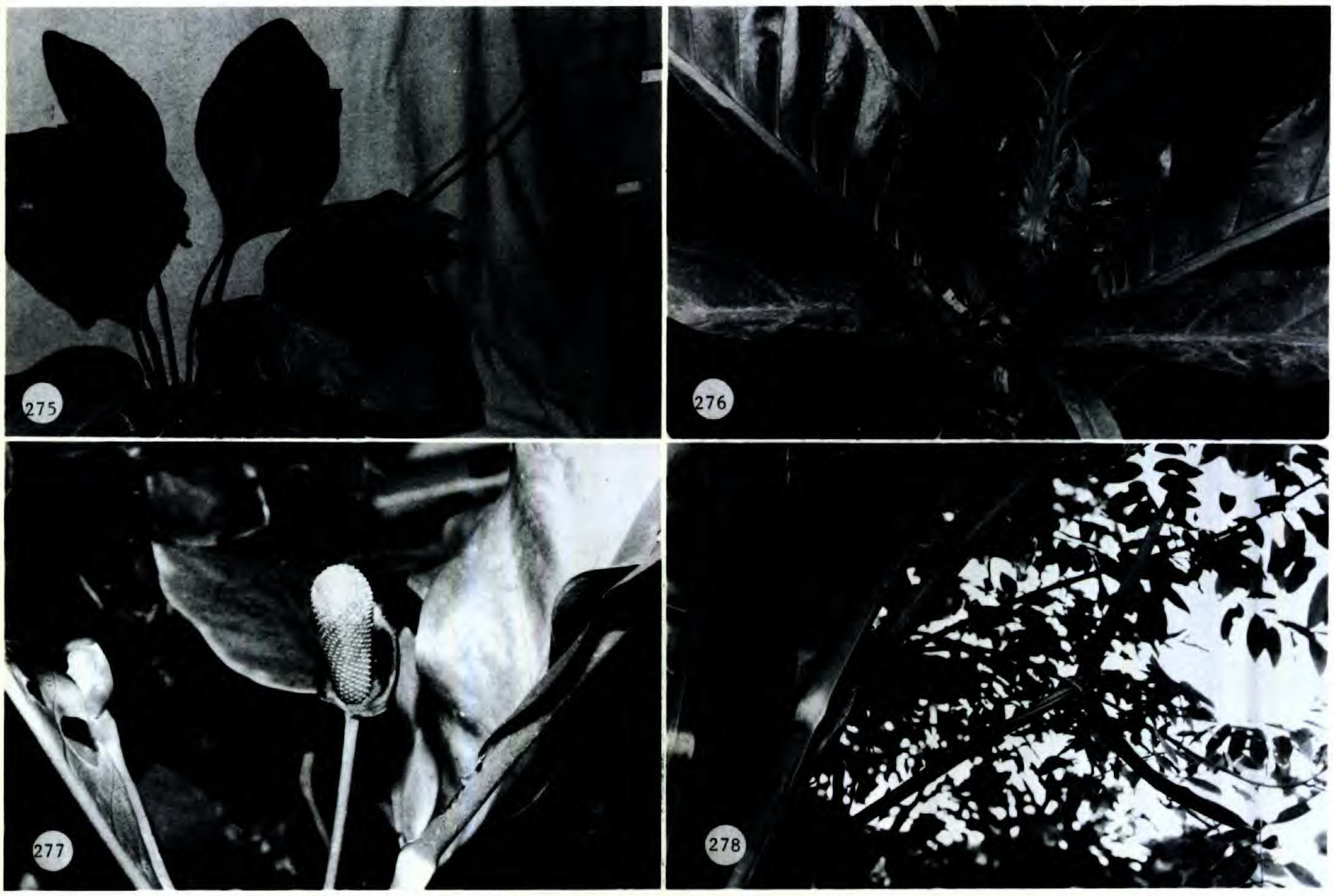
FIGURES 263–266.—263. *Anthurium purpureospathum* Croat, *Croat 60145.*—264. *A. purpureospathum* Croat, *Croat 33139.*—265. *A. ranchoanum* Engl., *Croat 36053.*—266. *A. ranchoanum* Engl., *Croat 47130.*



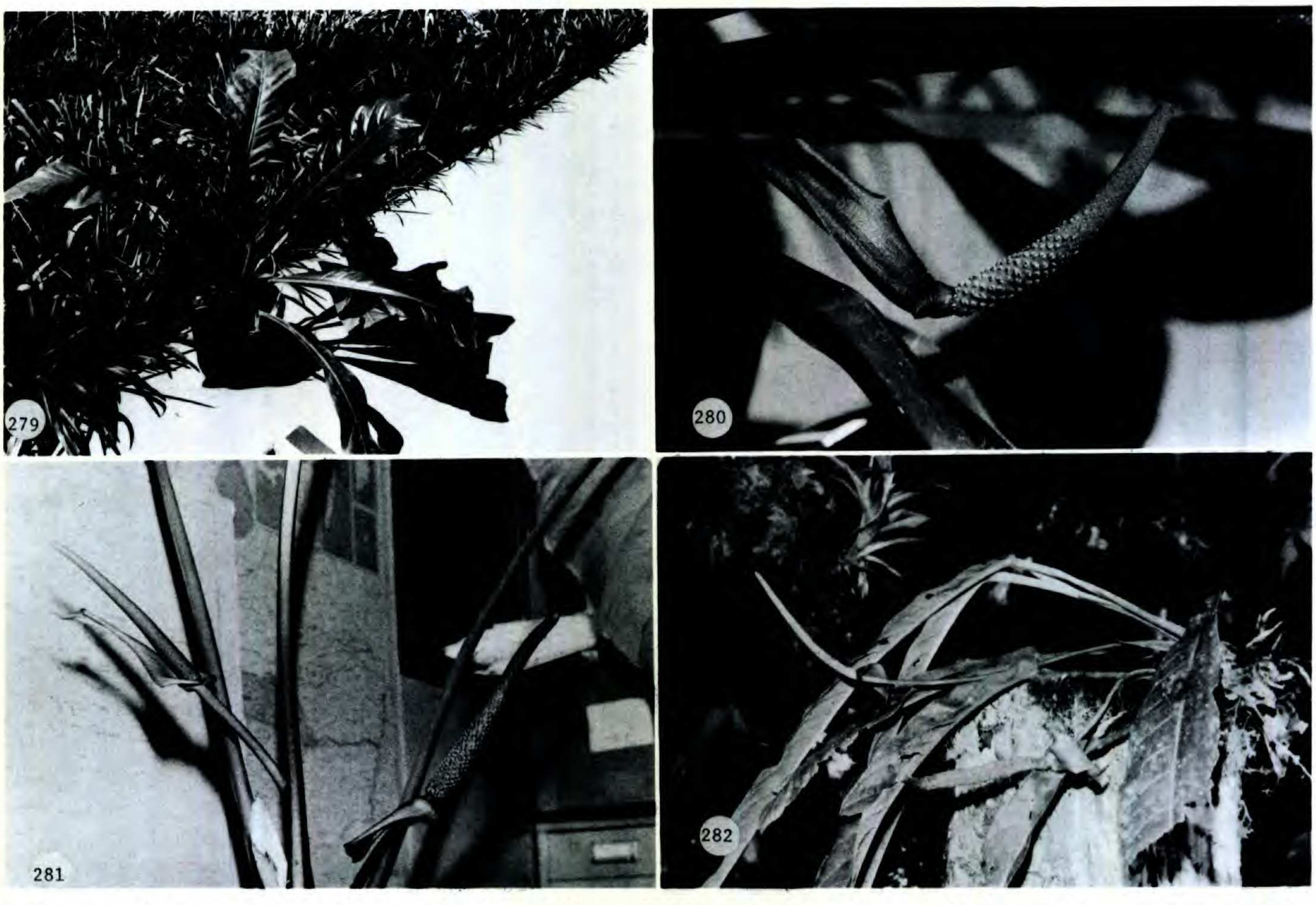
FIGURES 267–270.—267, 268. *Anthurium reflexinervium* Croat, *Plowman 7585*.—269. *A. salvadorense* Croat, *Croat 42092*.—270. *A. salviniae* Hemsley, Panama: Barro Colorado Island (not collected).



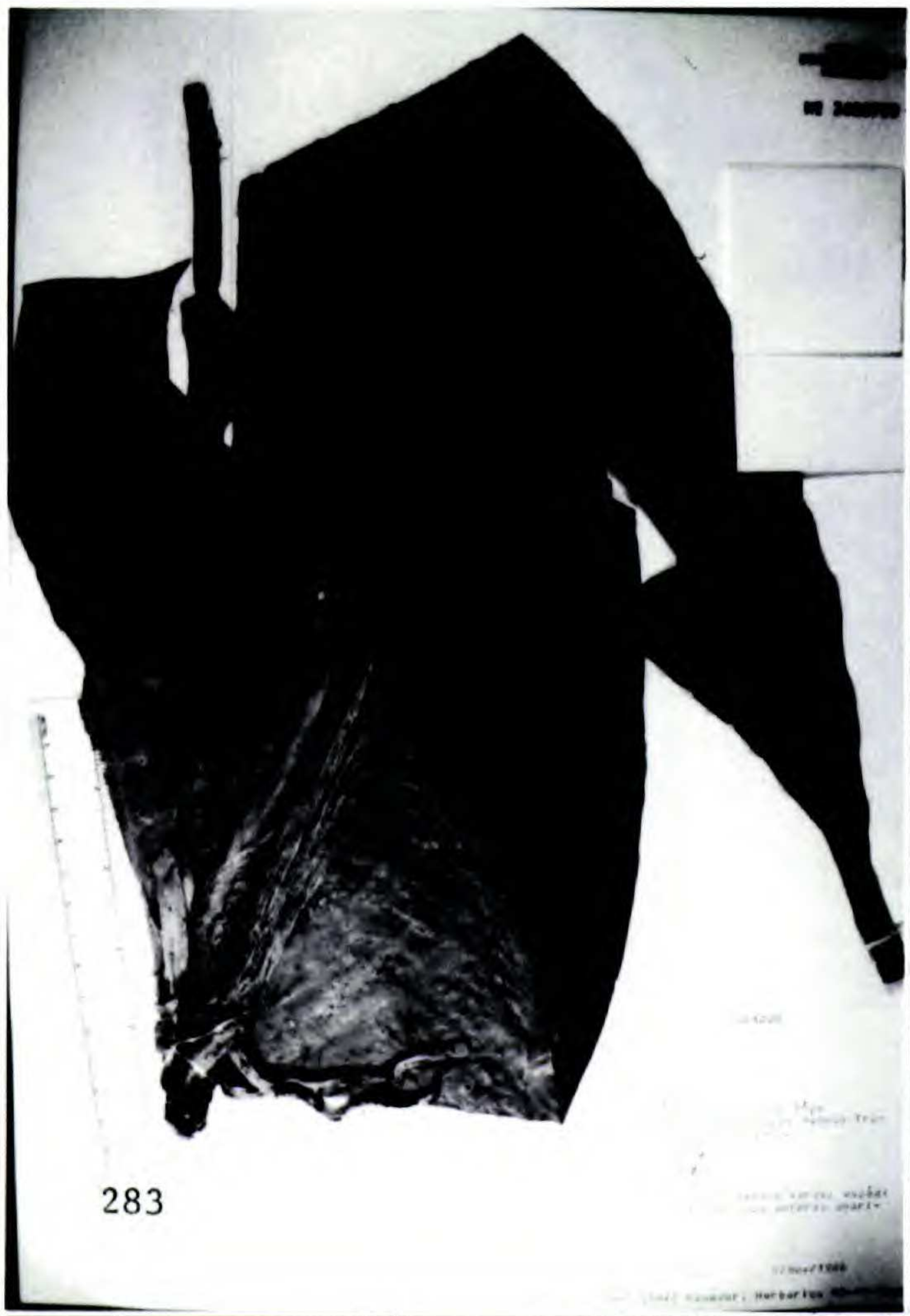
FIGURES 271–274.—271. *Anthurium reflexinervium* Croat, *Plowman 7585*.—272. *A. remotigeniculatum* Croat, cultivated at Selby Bot. Gard. (*SEL 81-2284*).—273. *A. salvadorense* Croat, *Croat 42169*.—274. *A. salviniae* Hemsley, *Croat 56579*.

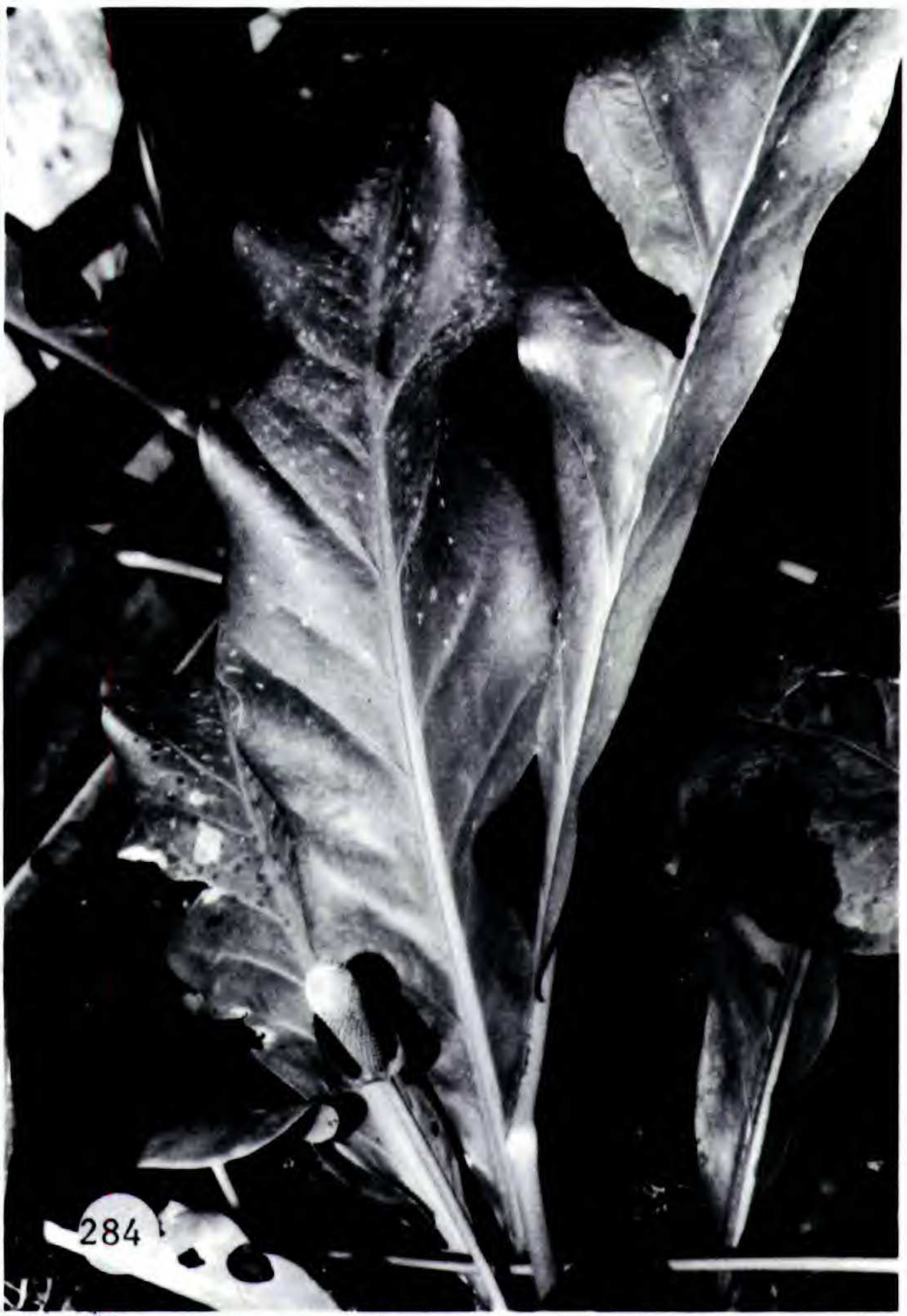


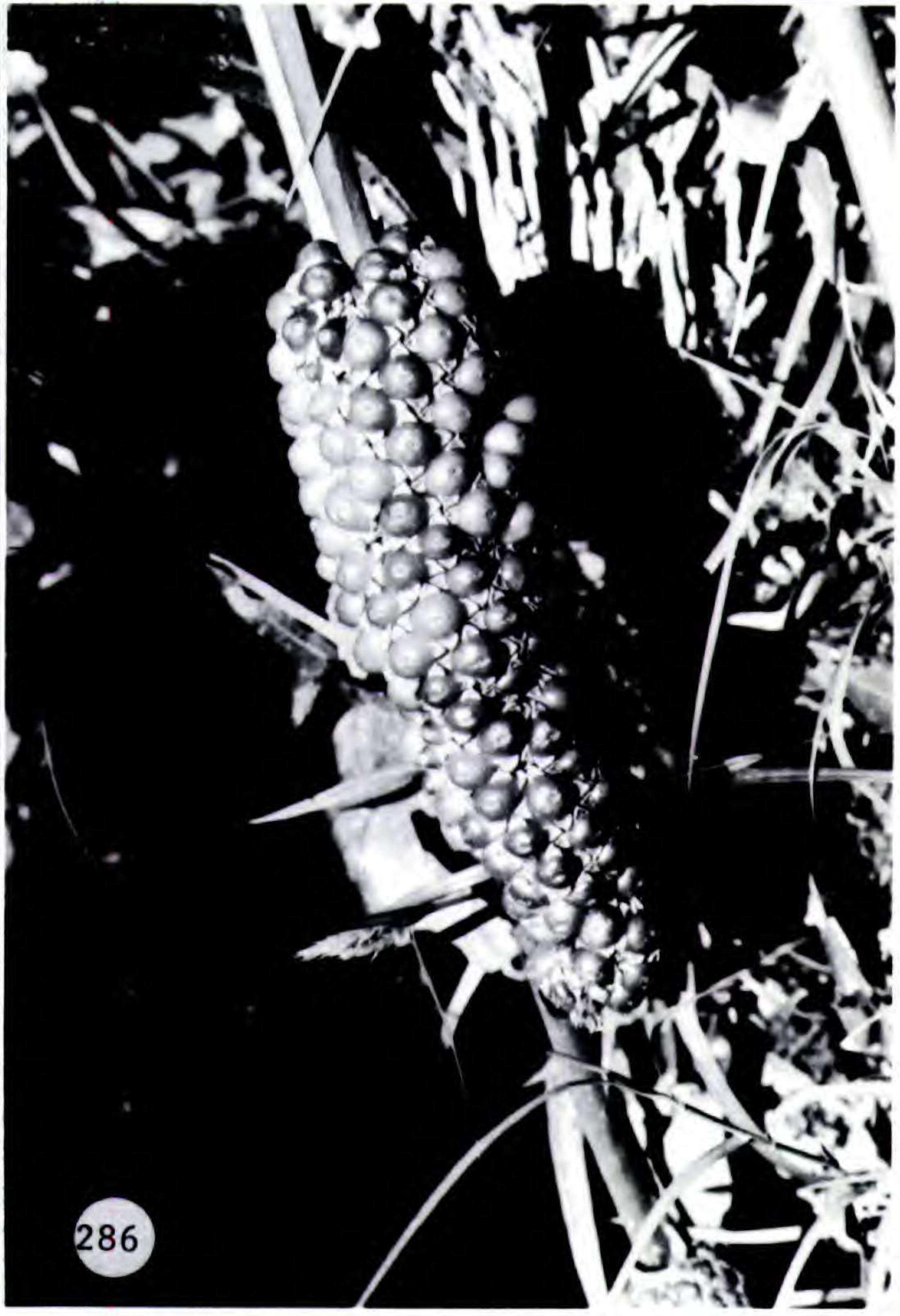
FIGURES 275–278.—275. *Anthurium remotigeniculatum* Croat, cultivated at Selby Bot. Gard. (*SEL 81-2284*), *Croat 58360.*—276. *A. salviniae* Hemsley, cultivated at Selby Bot. Gard.—277. *A. sarukhanianum* Croat & Haager, *Haager s.n.*, cultivated at Prague.—278. *A. schlechtendalii* Kunth subsp. *schlechtendalii*, *Croat 41525.*



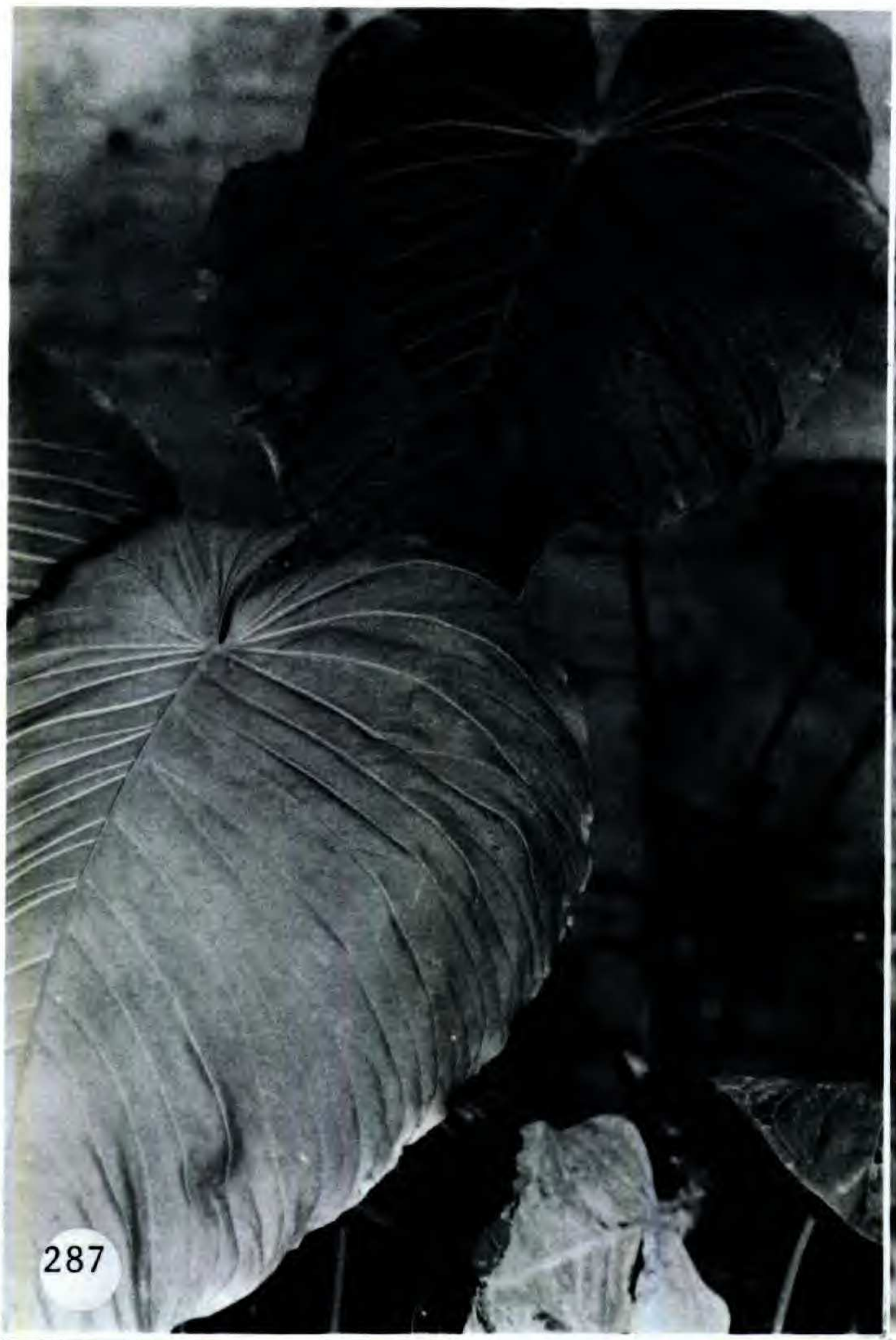
FIGURES 279–282.—279, 280. *Anthurium schlechtendalii* Kunth subsp. *jimenezii* (Matuda) Croat, *Croat 45694.*—281. *A. schottianum* Croat & R. A. Baker, *Croat 43247.*—282. *A. seibertii* Croat & R. A. Baker, *Croat 48568.*







FIGURES 283–286.—283. *Anthurium santiagoense* Croat, *Palacios 1492.*—284. *A. sarukhanianum* Croat & Haager, *Haager s.n.*, cultivated at Prague.—285. *A. schlechtendalii* Kunth subsp. *schlechtendalii, Croat 41802.*—286. *A. schlechtendalii* Kunth subsp. *schlechtendalii, Croat 39414.*



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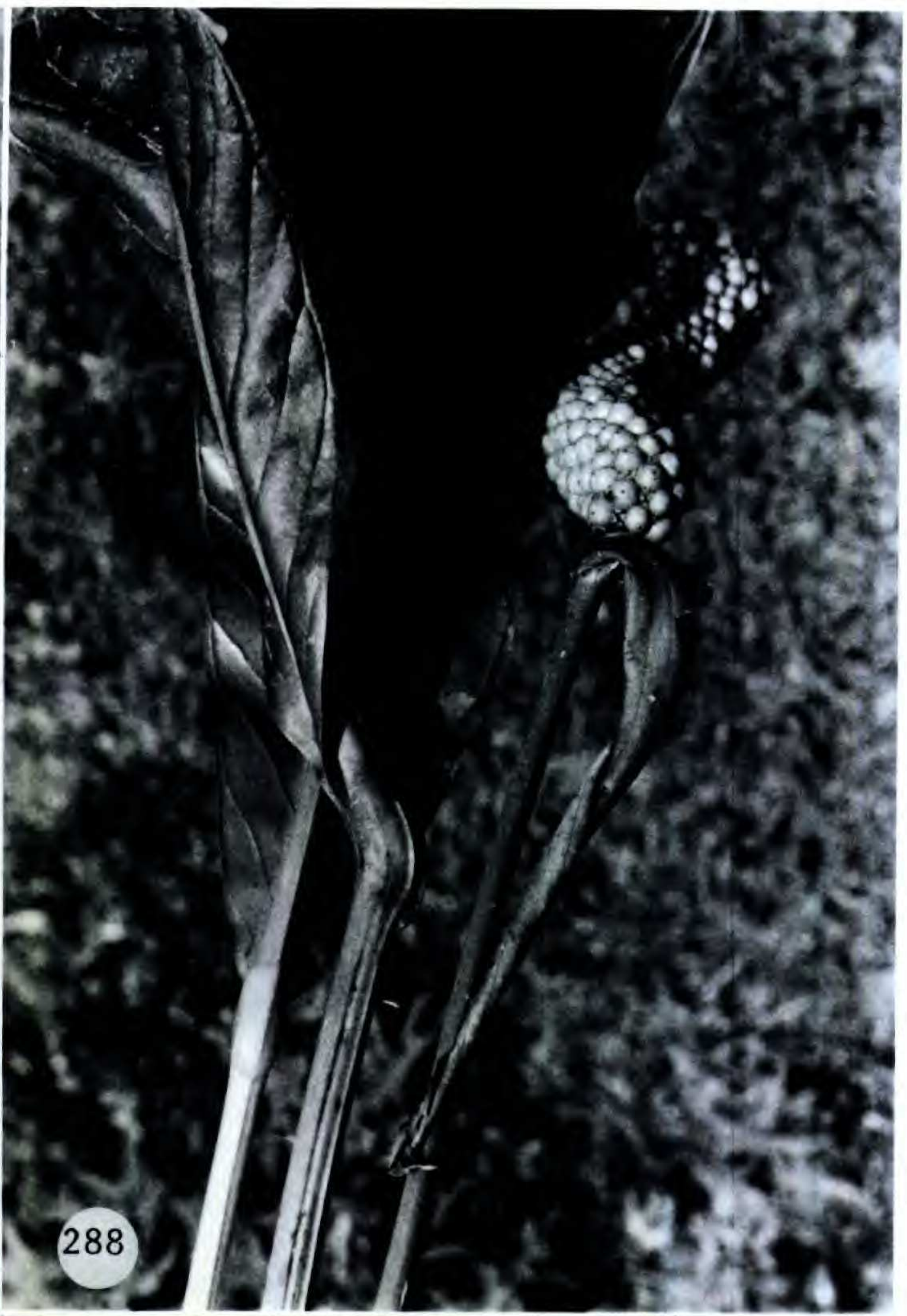

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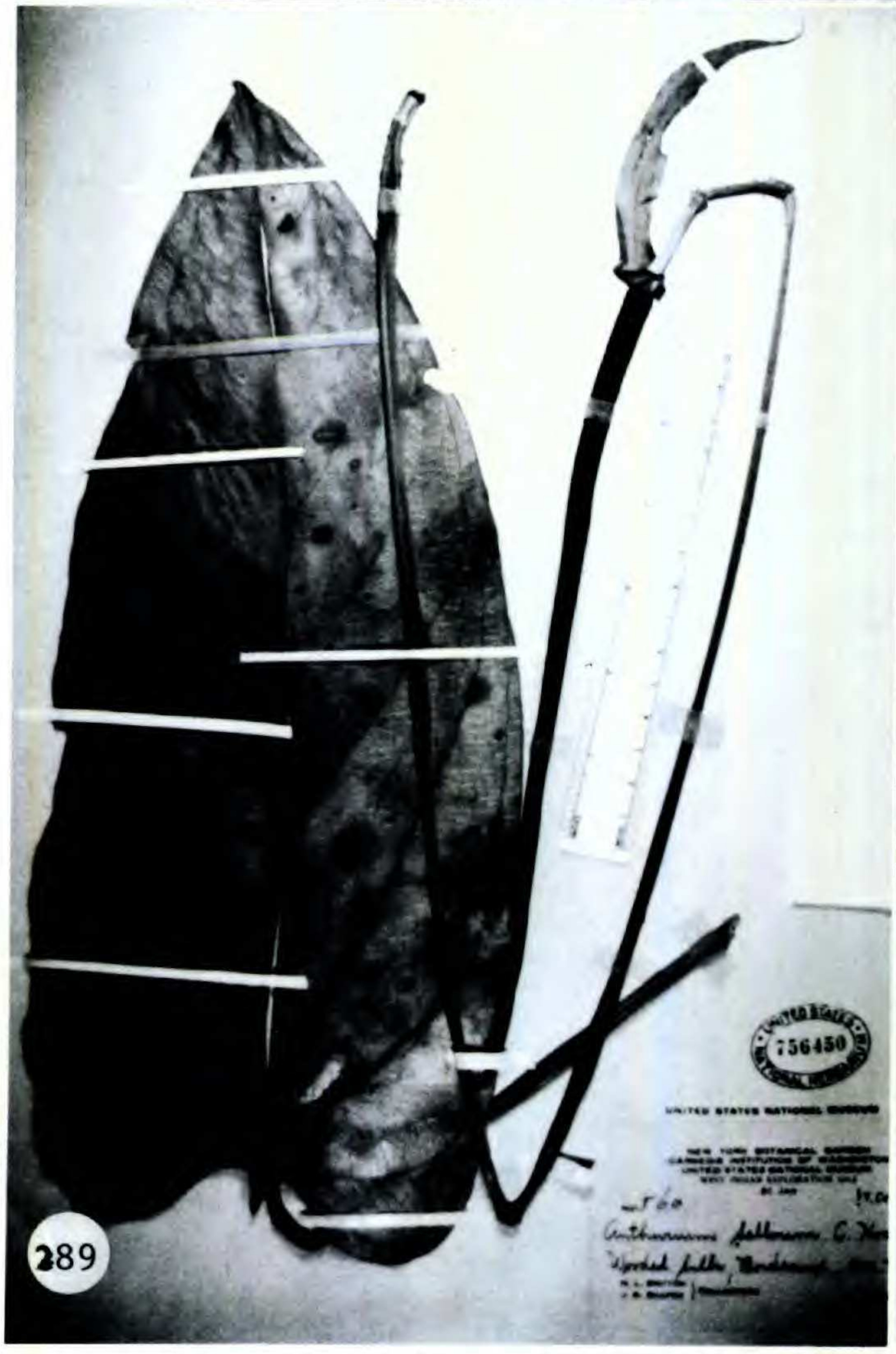

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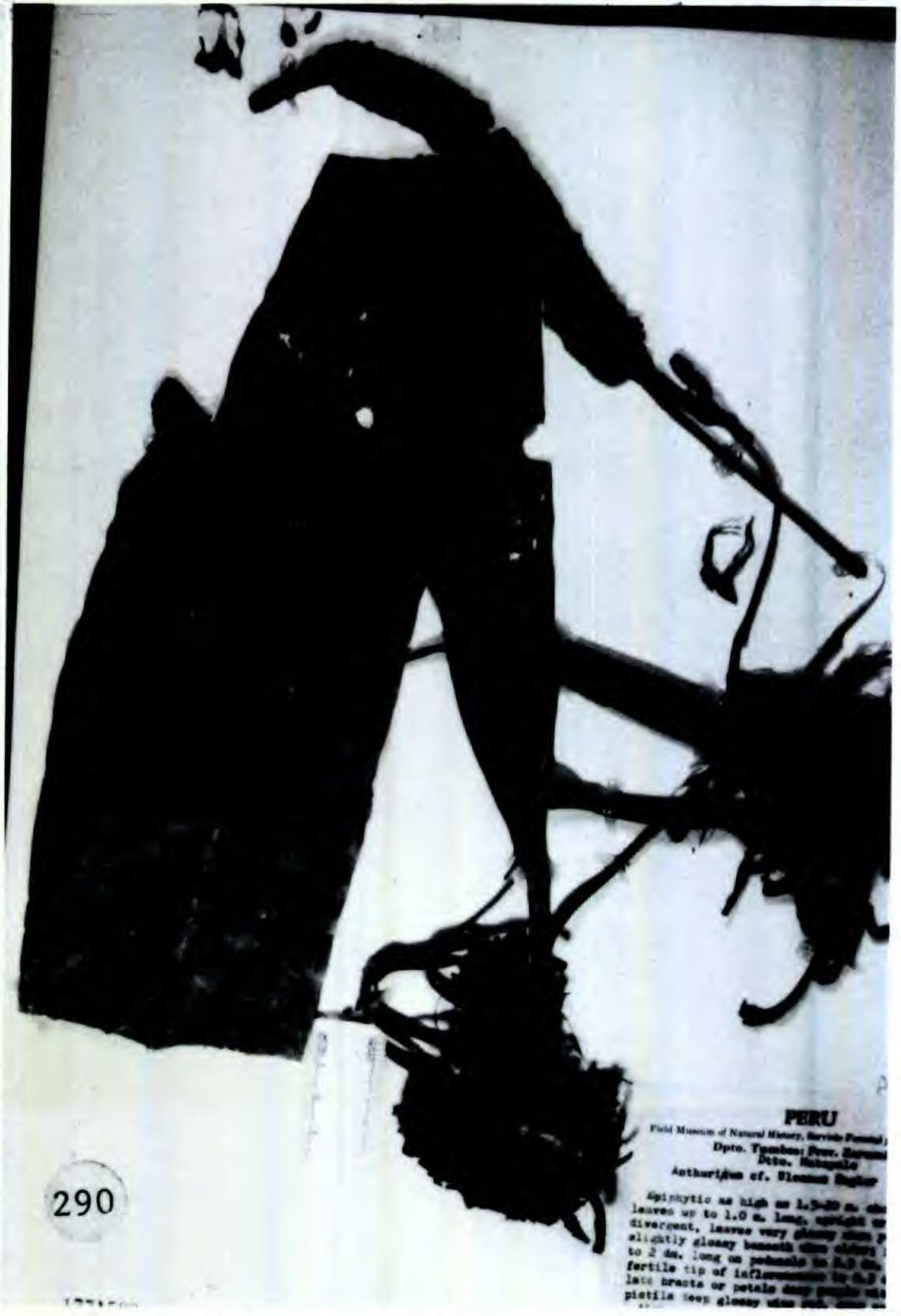

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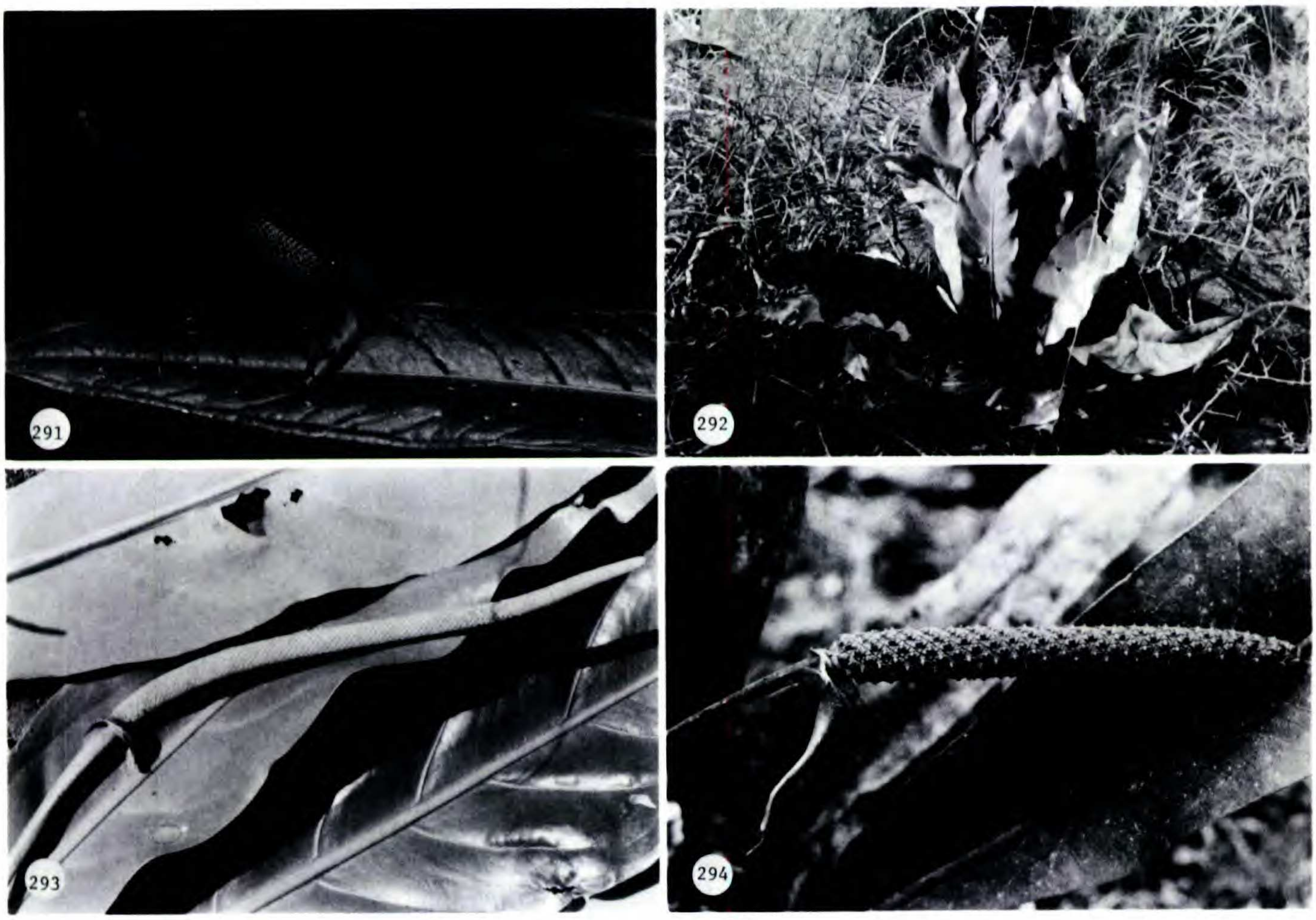
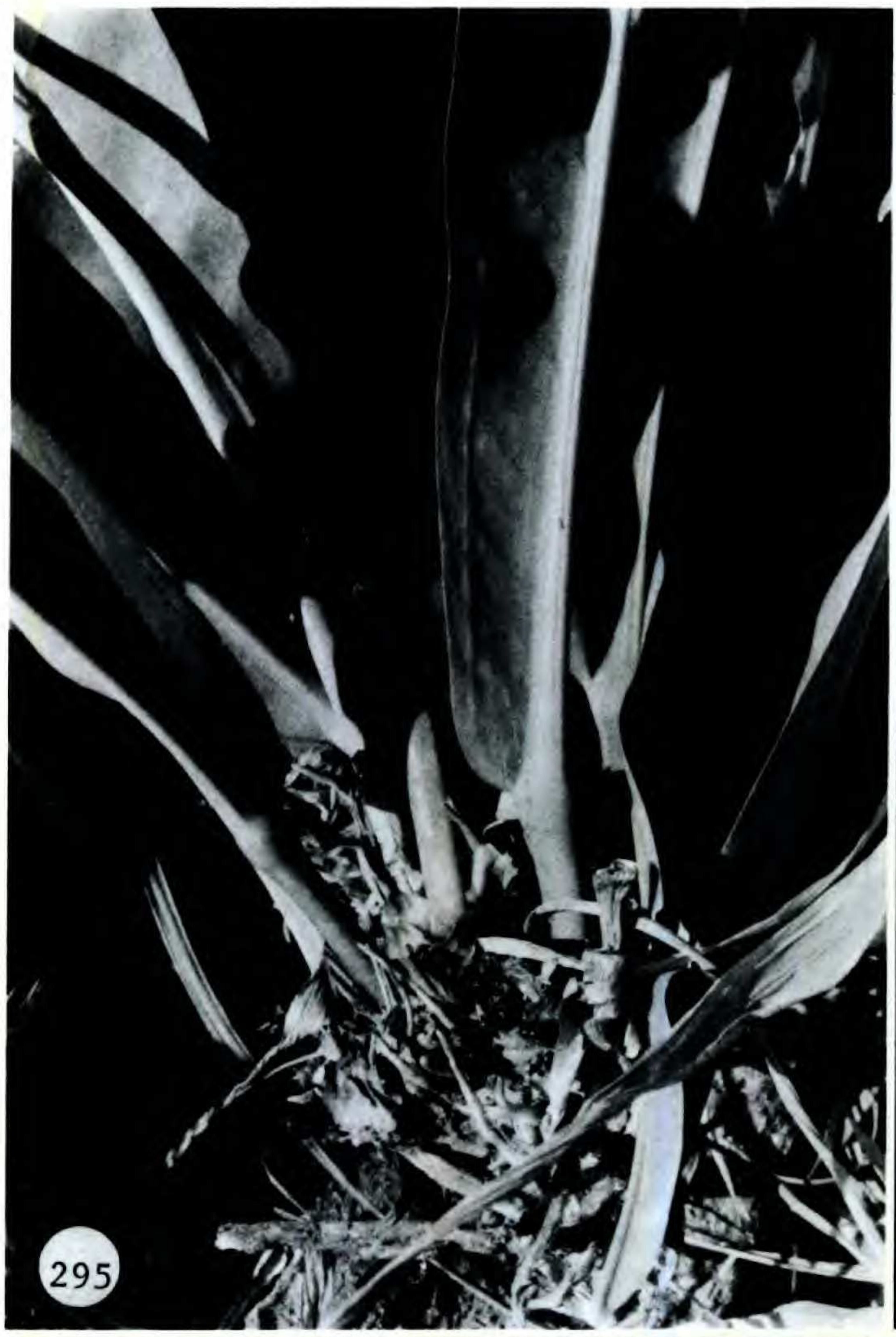
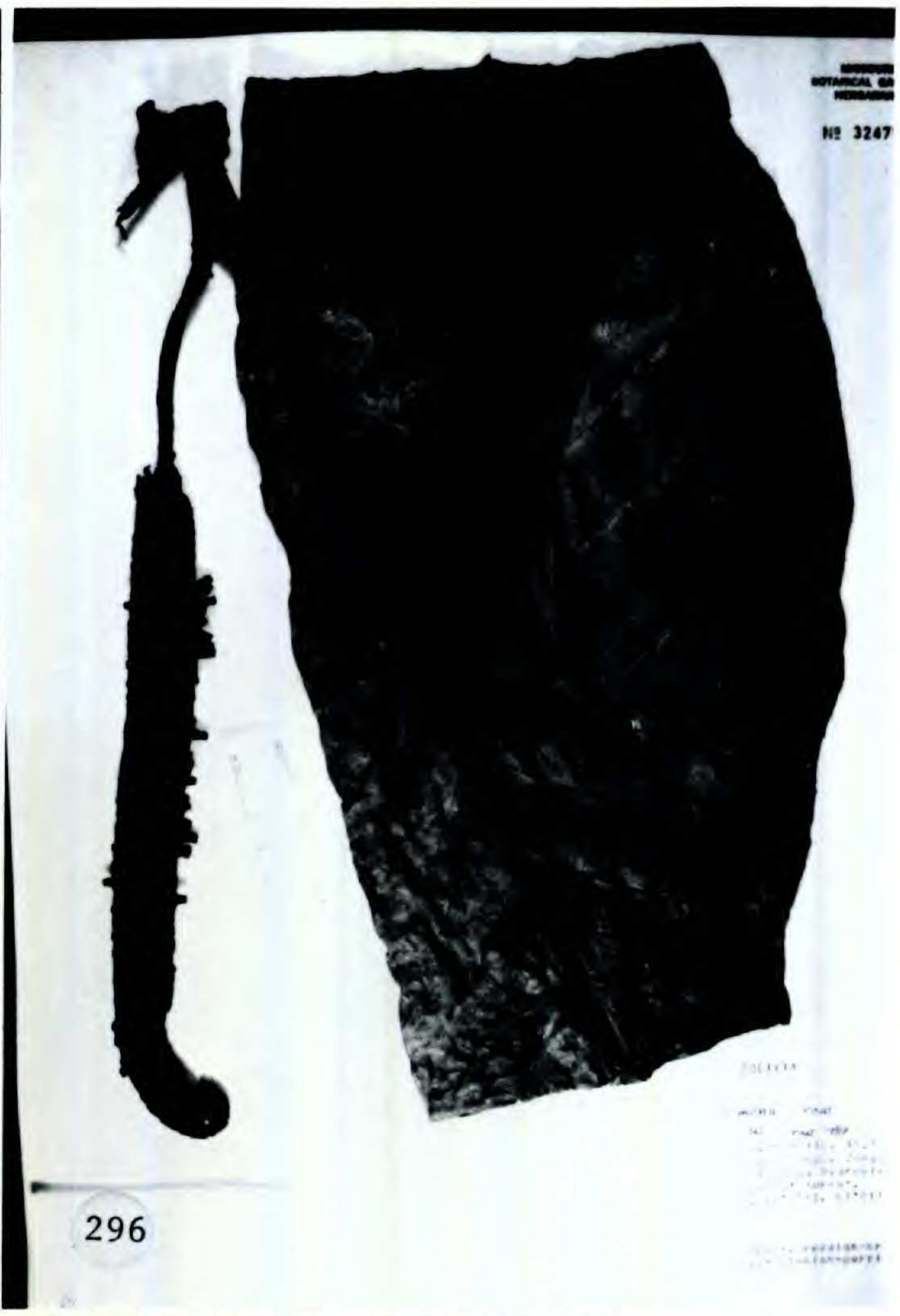
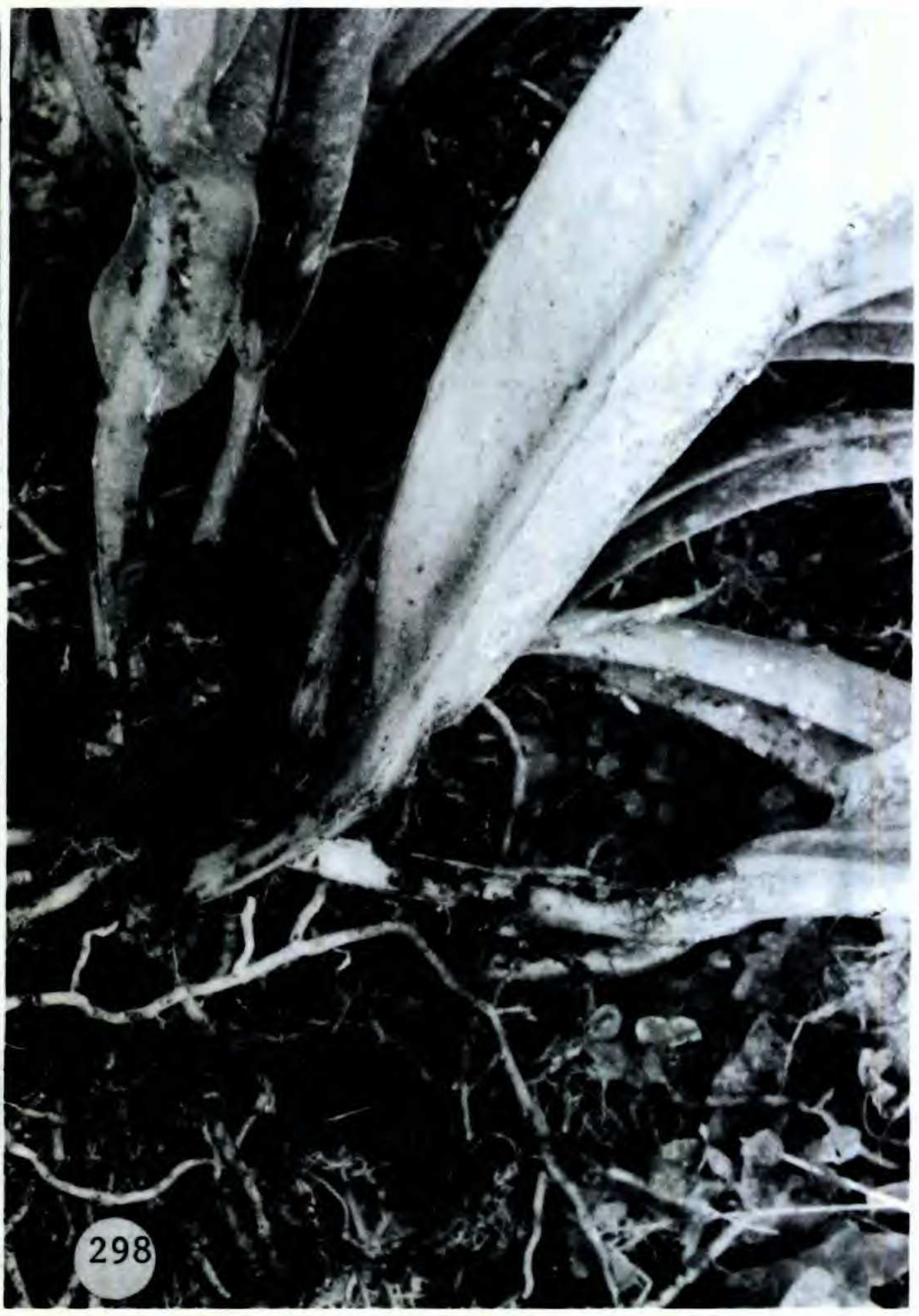
FIGURES 287–290.—287. *Anthurium schottianum* Croat & R. A. Baker, *Croat 43247*.—288. *A. seibertii* Croat & R. A. Baker, *Croat 10555*.—289. *A. selloum* K. Koch, *Britton & Shafer 560*.—290. *A. simpsonii* Croat, *Simpson & Schunke 392*.



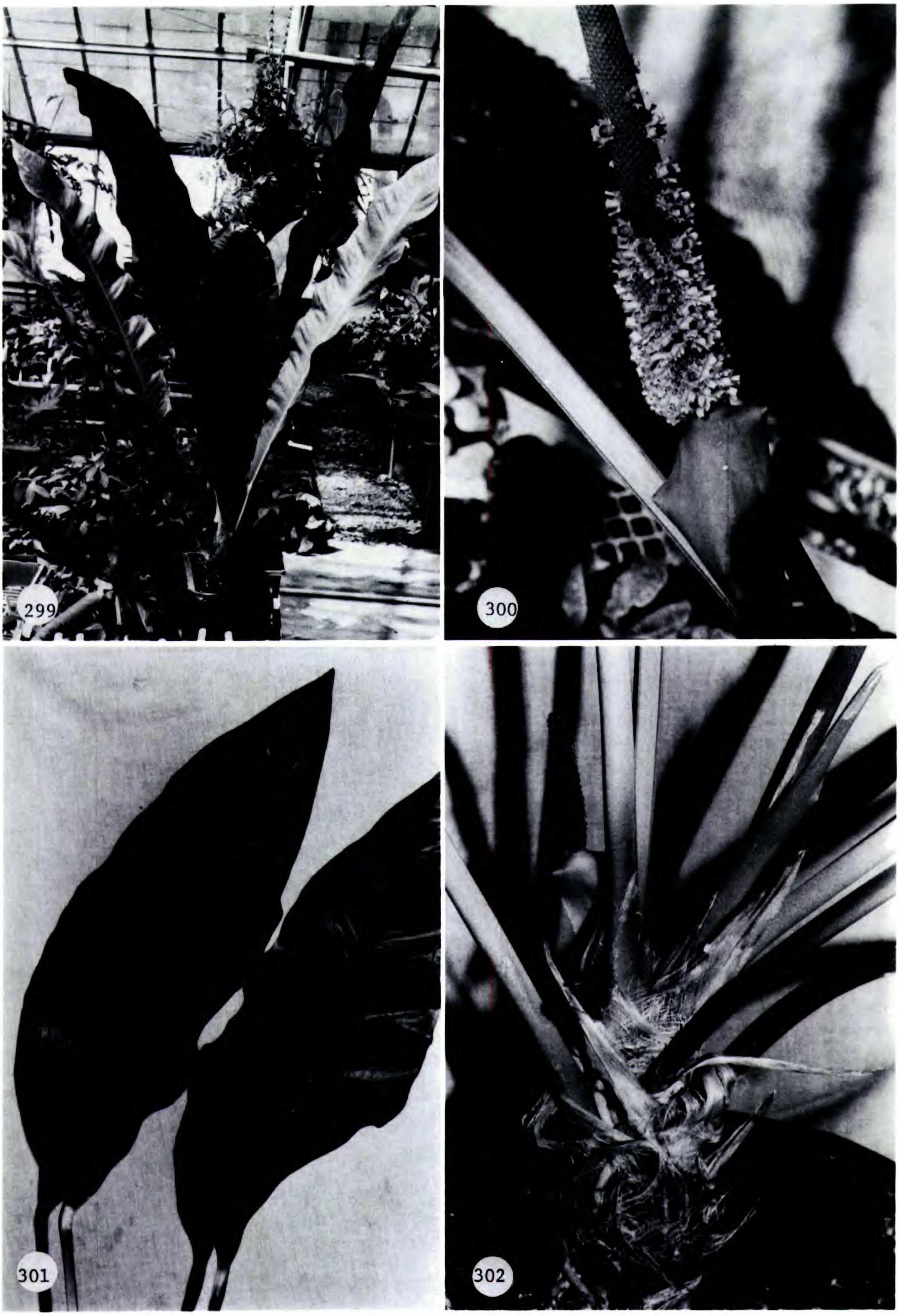
FIGURES 291–294.—291. *Anthurium seibertii* Croat & R. A. Baker, *Croat 26494.*—292, 293. *A. solitarium* (Vell. Conc.) Schott, *Croat 61894.*—294. *A. soukupii* Croat, *Croat 50747.*



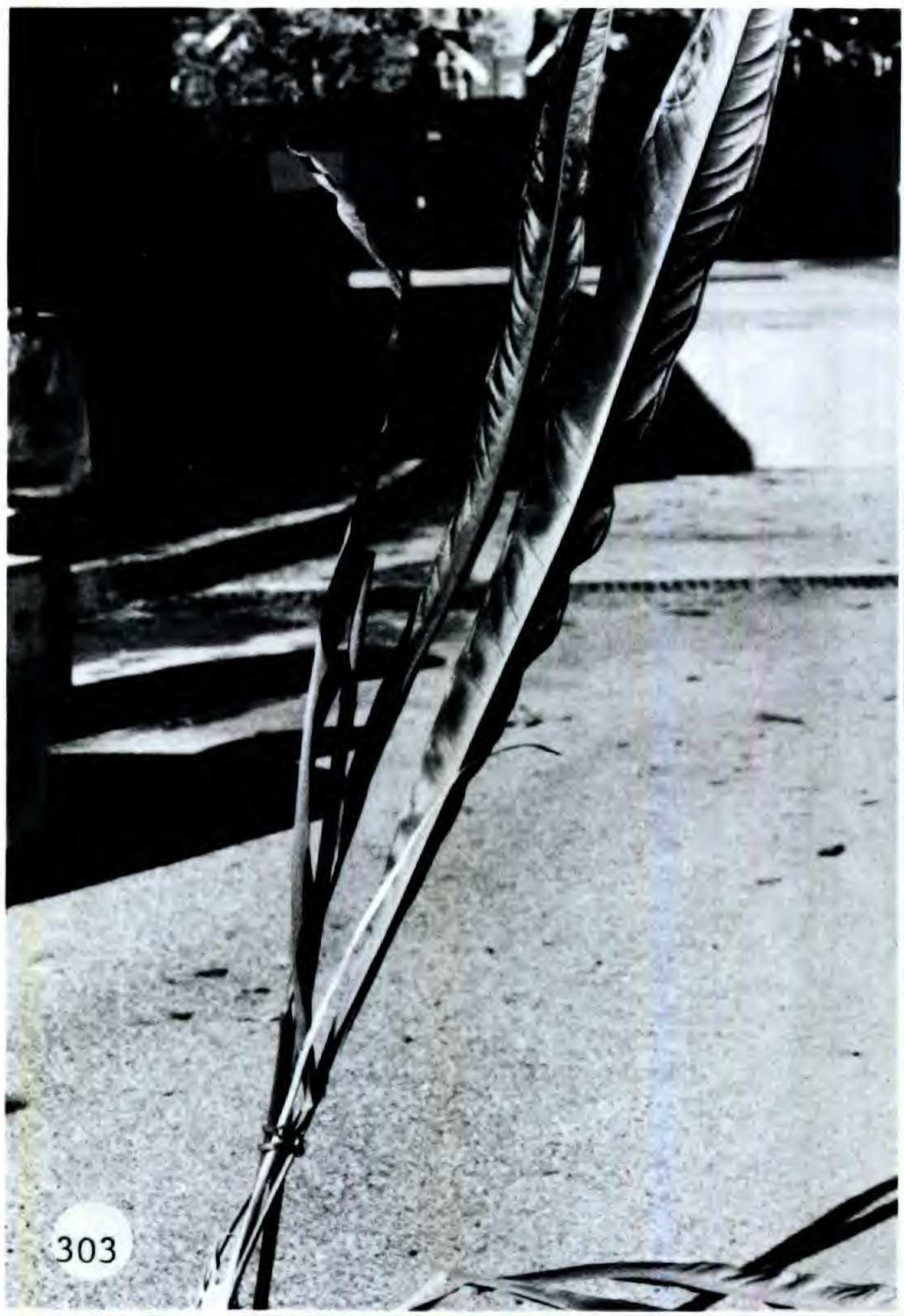




FIGURES 295–298.—295. *Anthurium solitarium* (Vell. Conc.) Schott, *Croat 61894.*—296. *A. solomonii* Croat, *Solomon 13000.*—297. *A. soukupii* Croat, *Croat 50747.*—298. *A. soukupii* Croat, *Croat 58298.*



FIGURES 299–302.—299, 300. *Anthurium sparreorum* Croat, cultivated at Selby Bot. Gard. (*SEL #15-75-323*).—301, 302. *A. sparreorum* Croat, *Croat 57195*, cultivated by T. Fennel, Homestead, Florida.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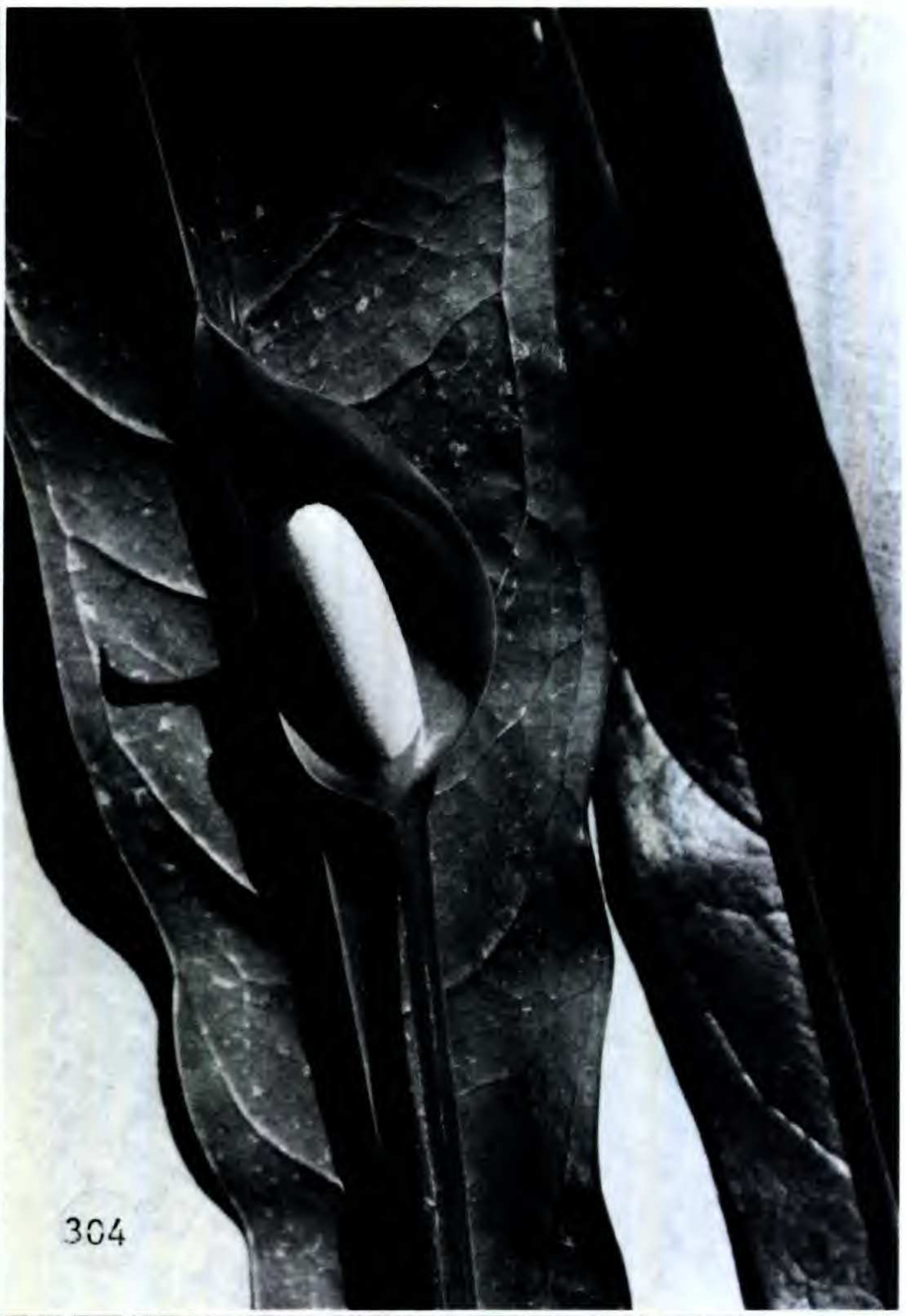
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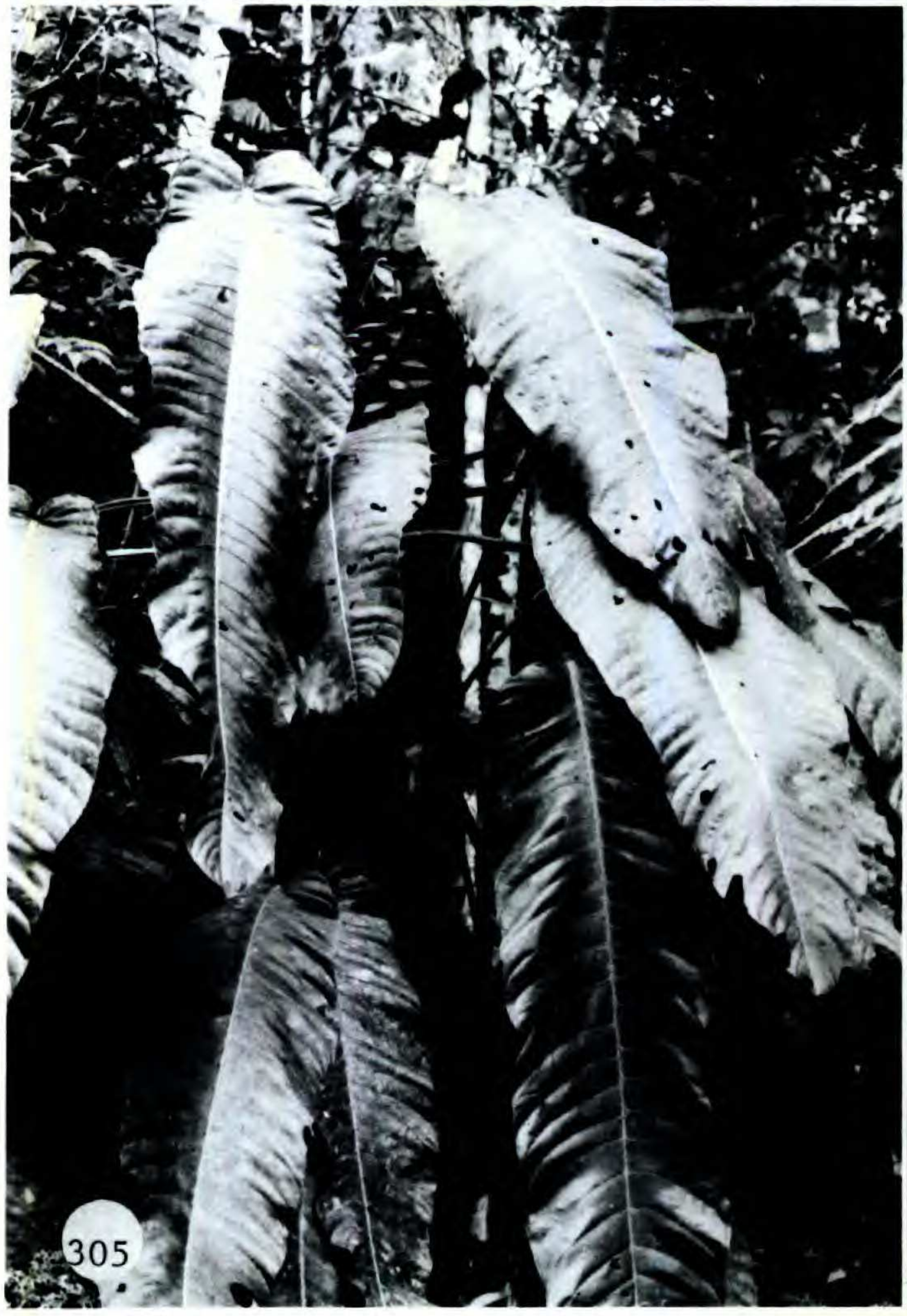
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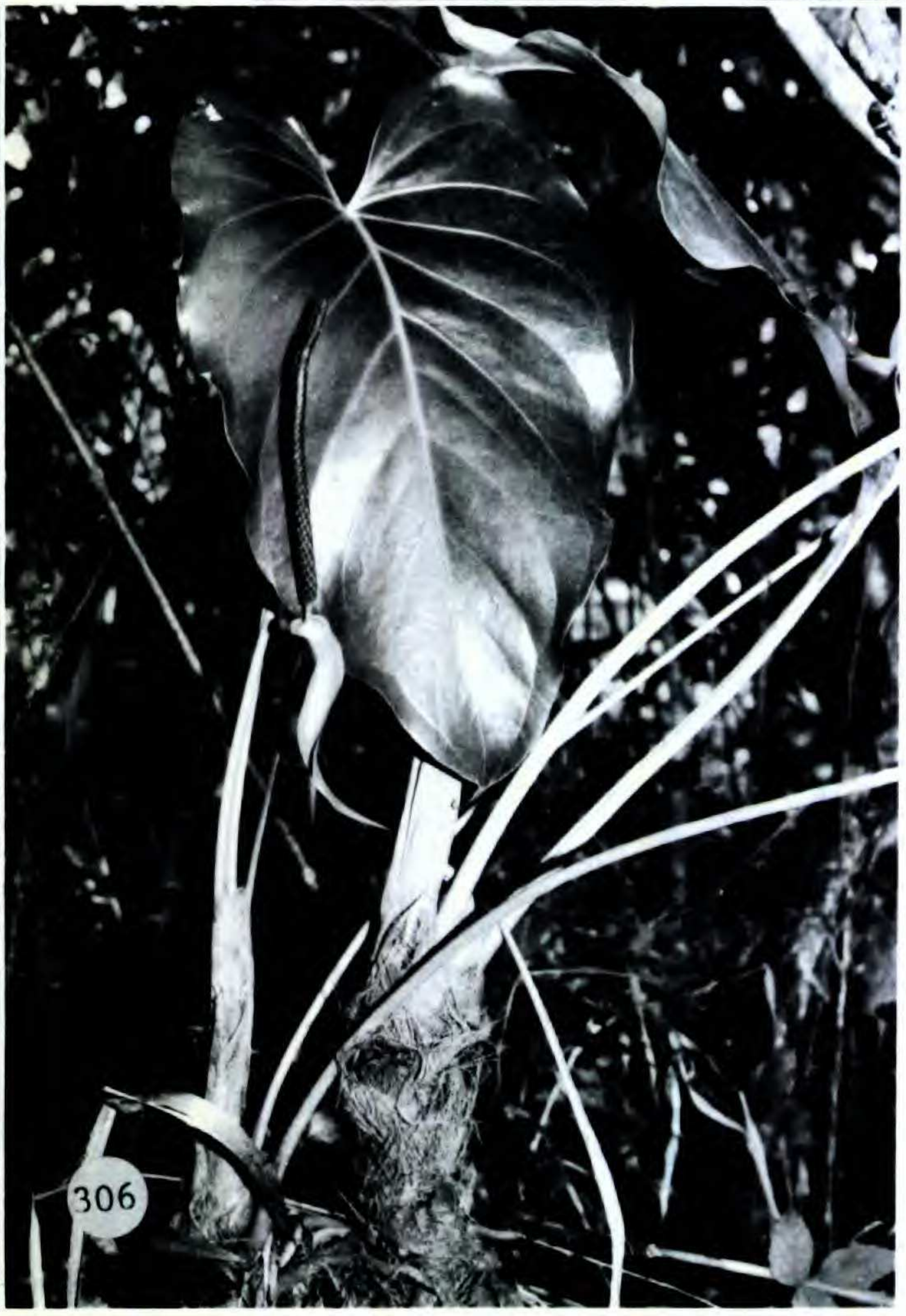
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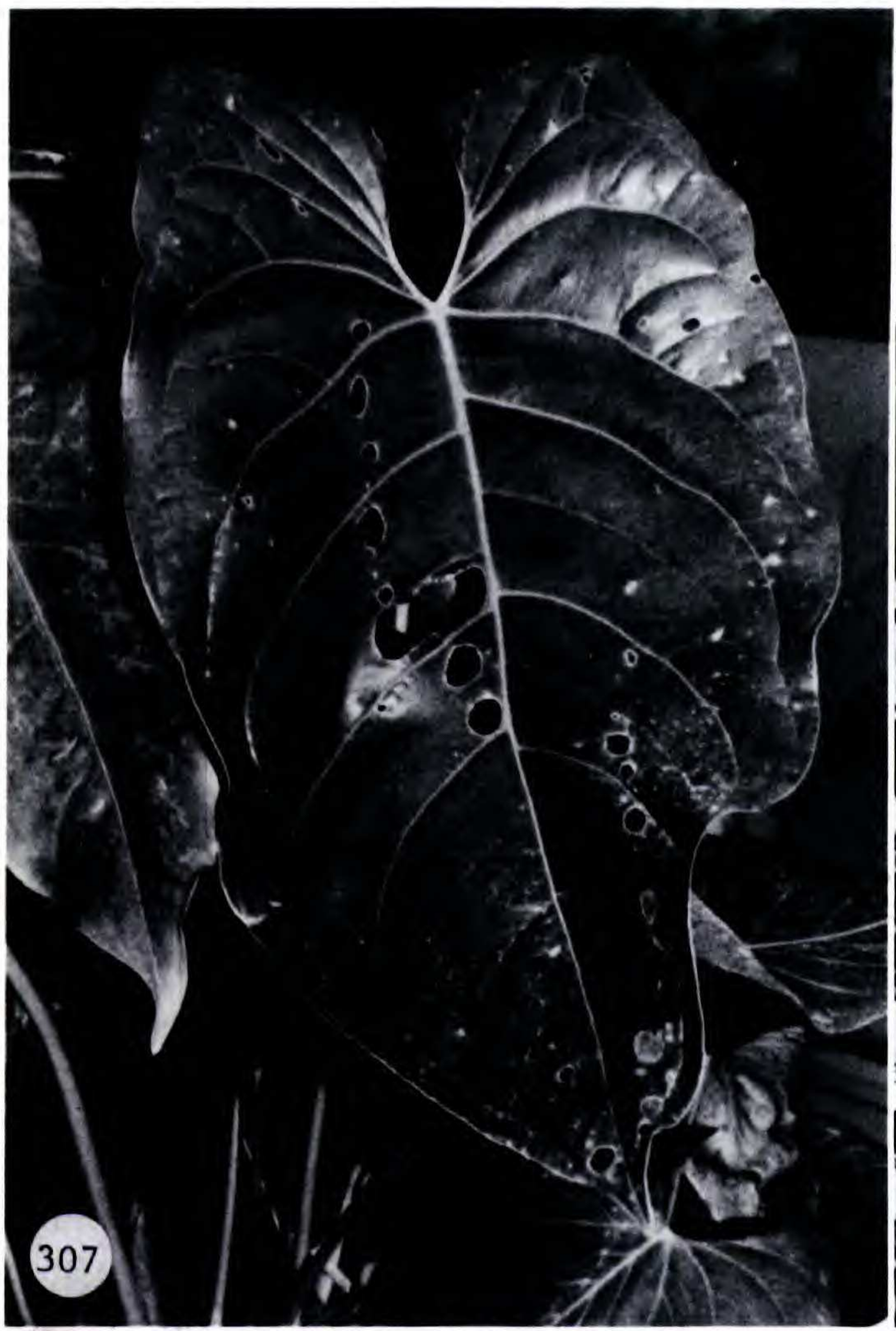
FIGURES 303–306.—303. *Anthurium spathiphyllum* N. E. Br., *Croat 44309.*—304. *A. spathiphyllum* N. E. Br., *Grayum & Schatz 644.*—305. *A. spectabile* Schott, cultivated at Las Cruces Bot. Gard.—306. *A. standleyi* Croat & R. A. Baker, *Croat 43431.*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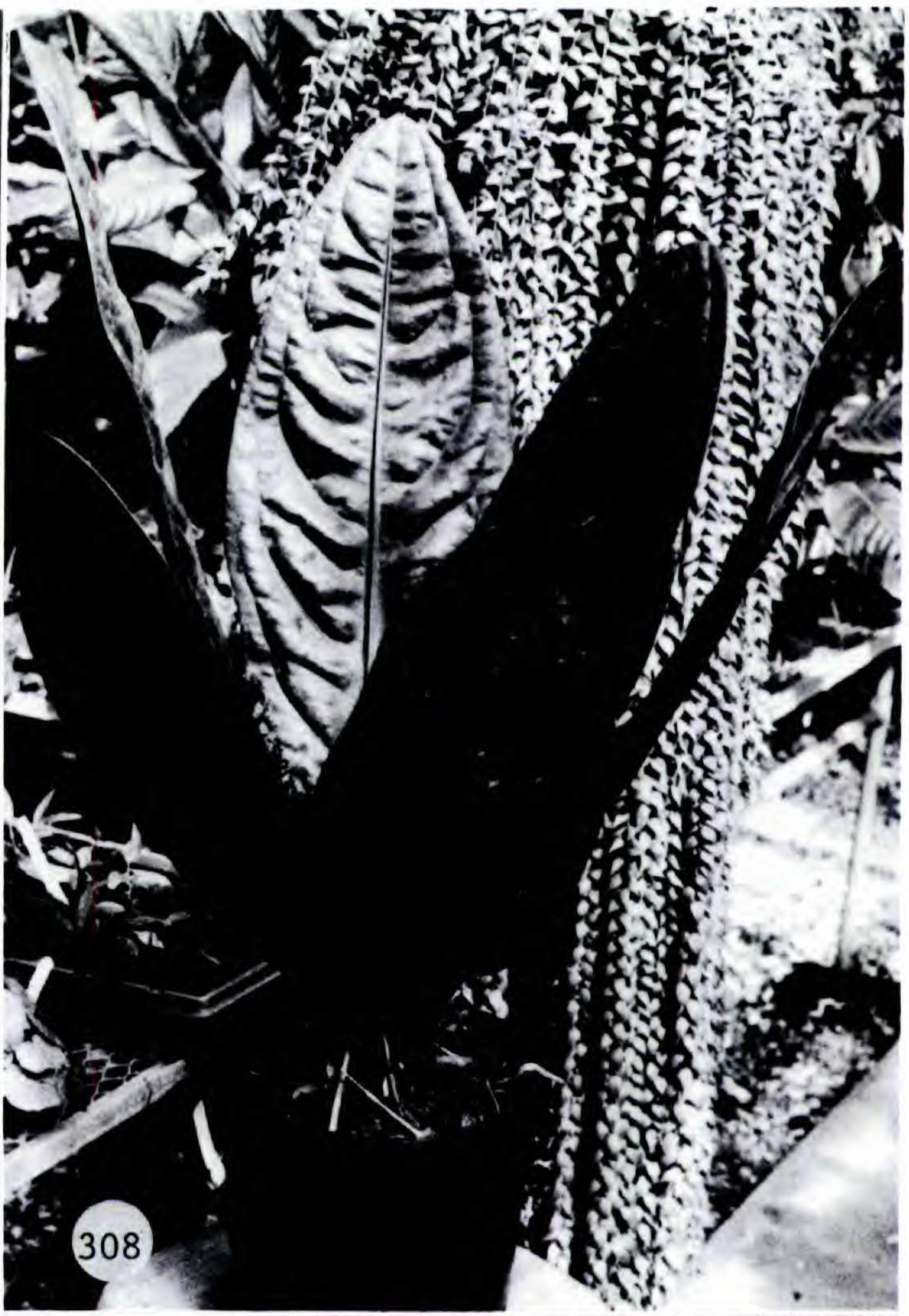
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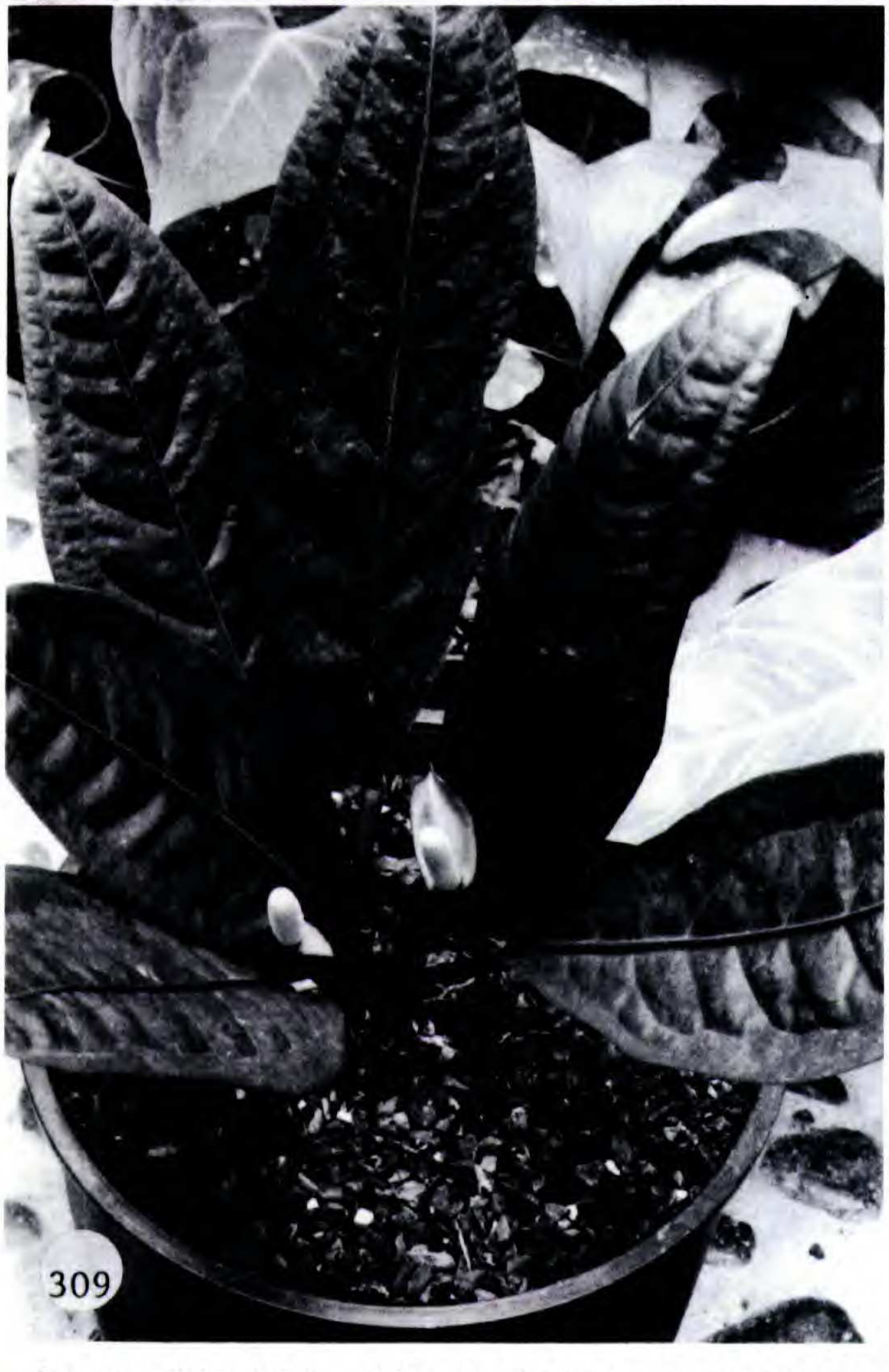
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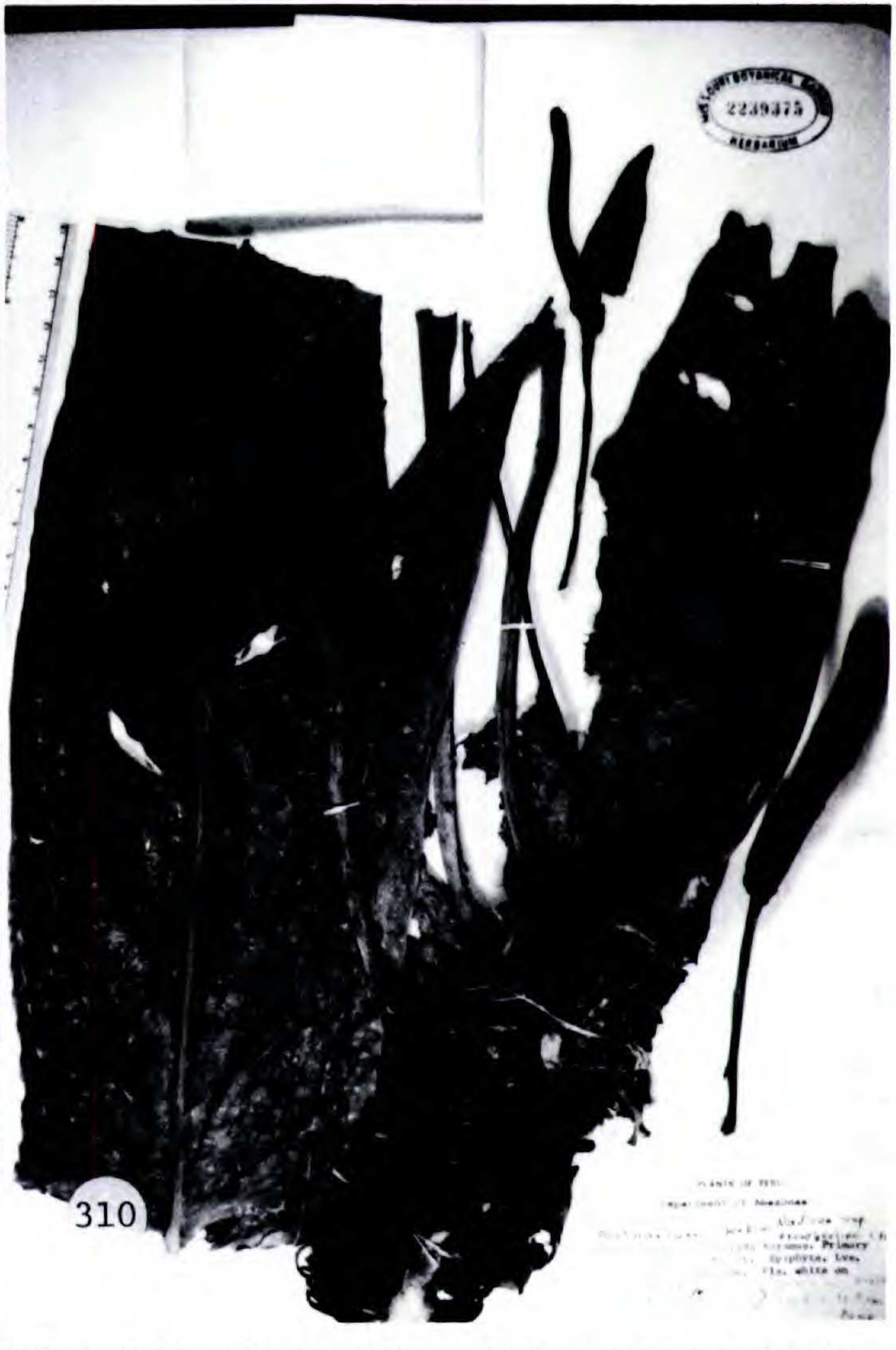
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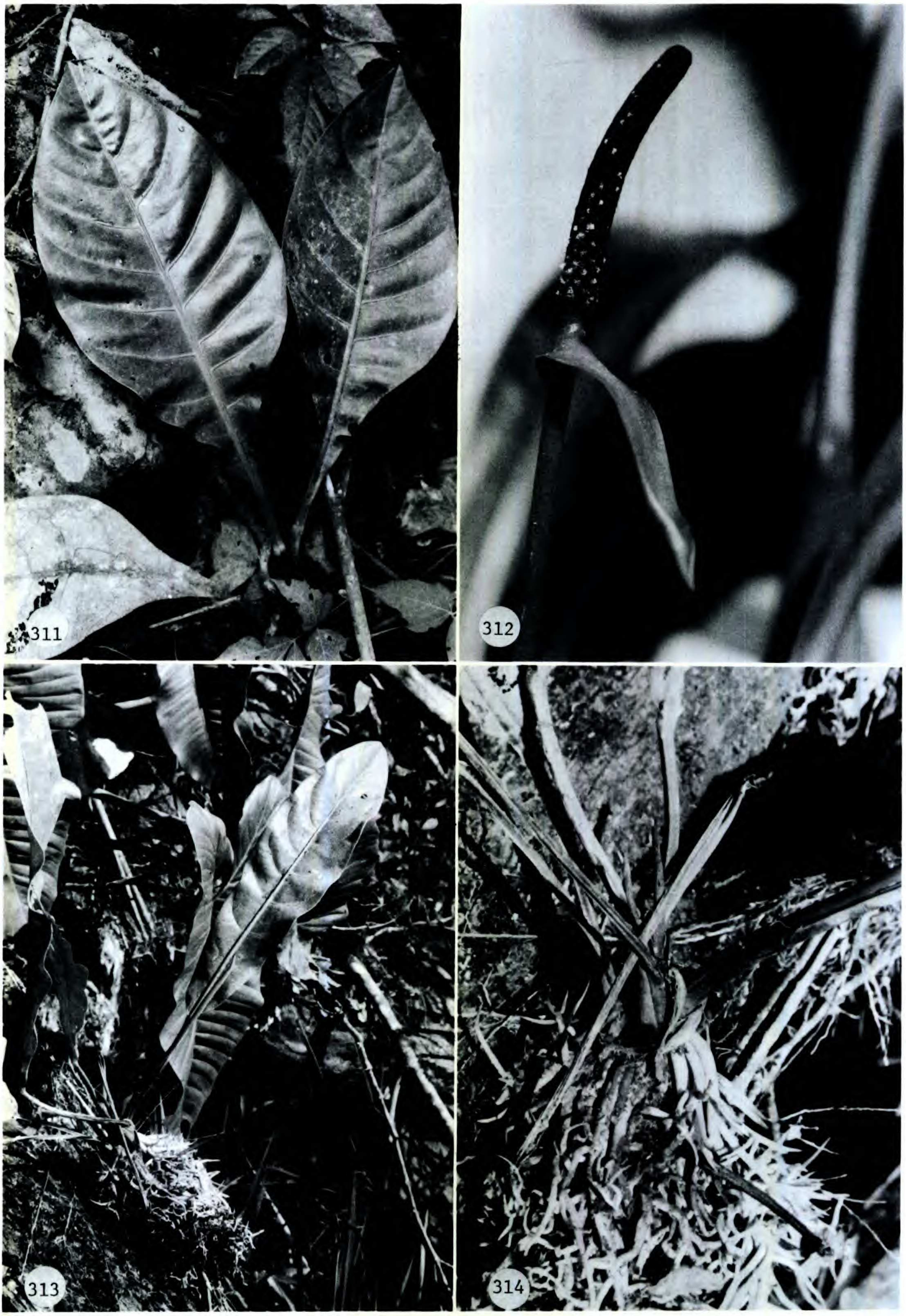
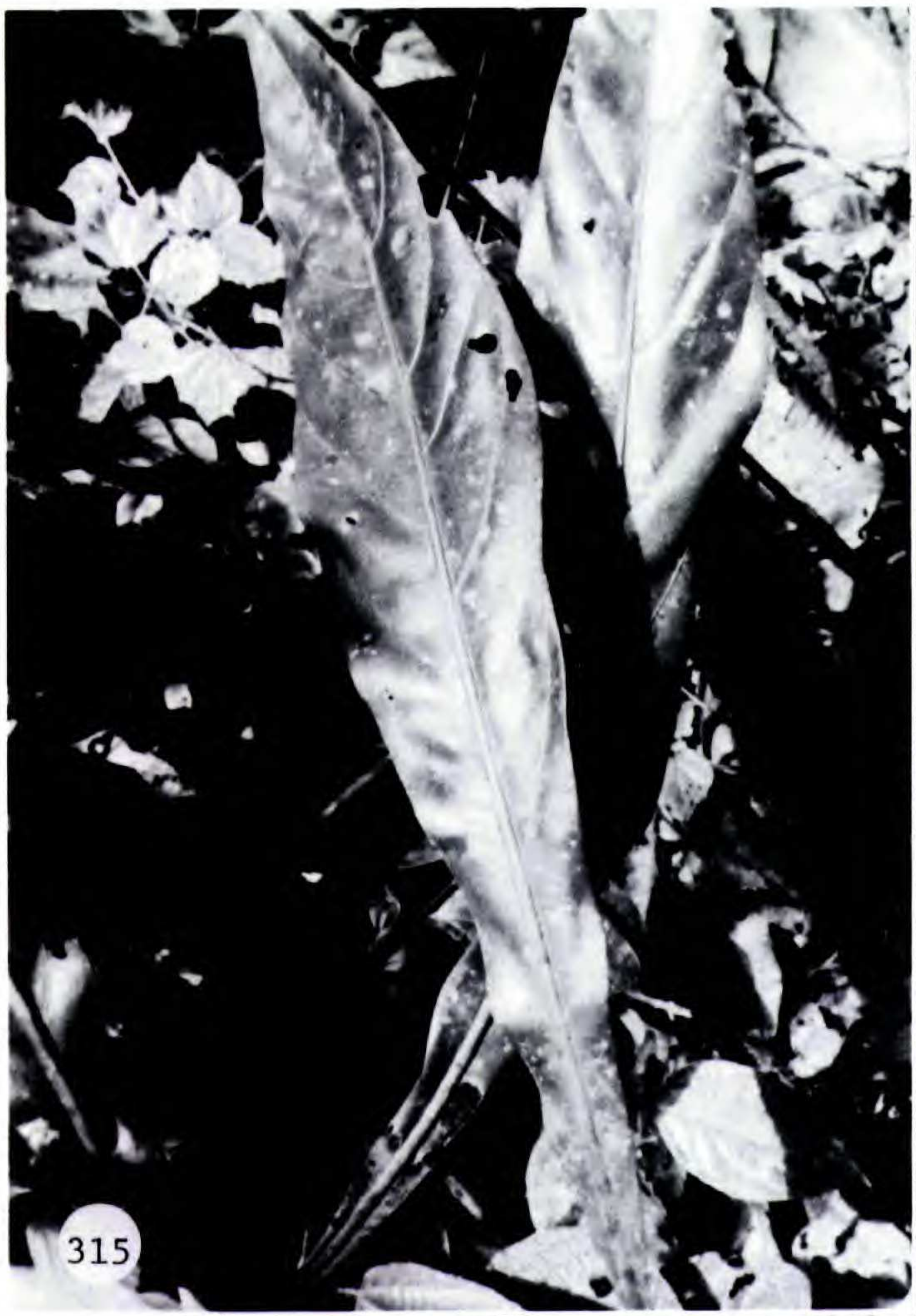
FIGURES 307–310.—307. *Anthurium standleyi* Croat & R. A. Baker, *Croat 43431.*—308. *A. superbum* Madison subsp. *superbum*, cultivated at Selby Bot. Gard. (*SEL #77-61*).—309. *A. superbum* Madison subsp. *superbum*, cultivated by D. Hull, San Diego, California.—310. *A. superbum* subsp. *brentberlinii* Croat, *Berlin 513.*



FIGURES 311–314.—311. *Anthurium tarapotense* Engl., *Croat 58130.*—312. *A. tarapotense* Engl., *Croat 58115.*—313, 314. *A. tenaense* Croat, *Croat 49631.*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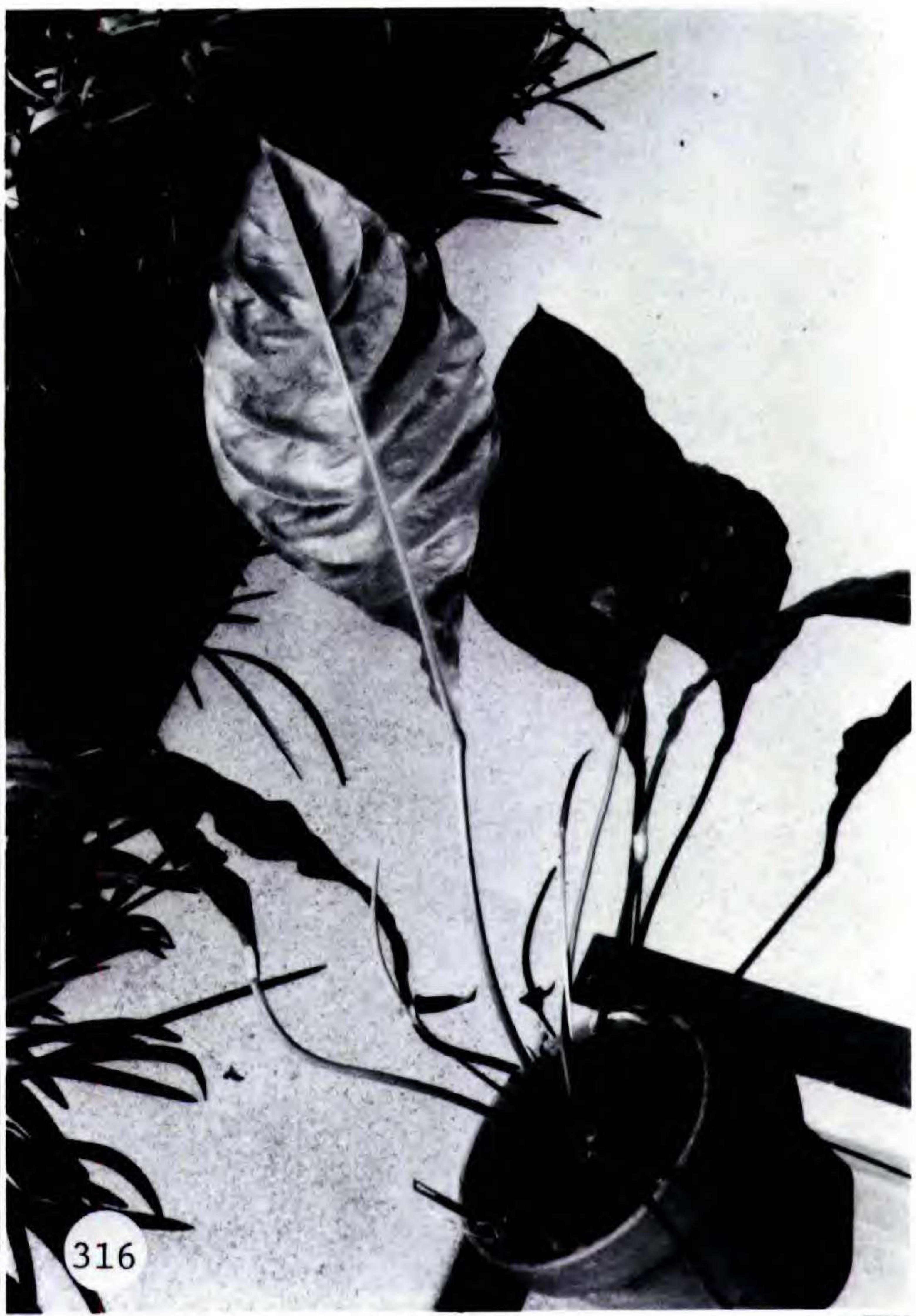
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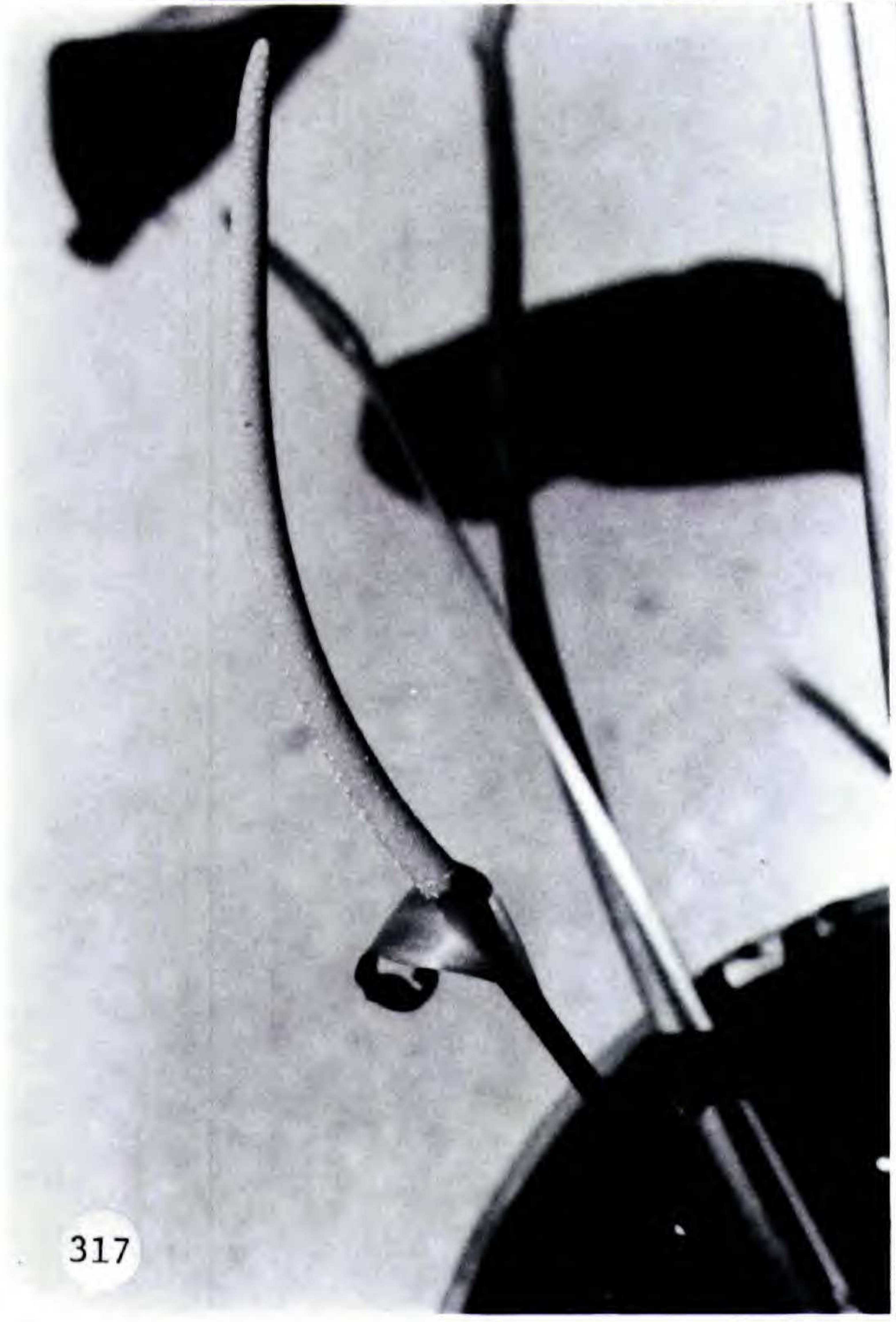
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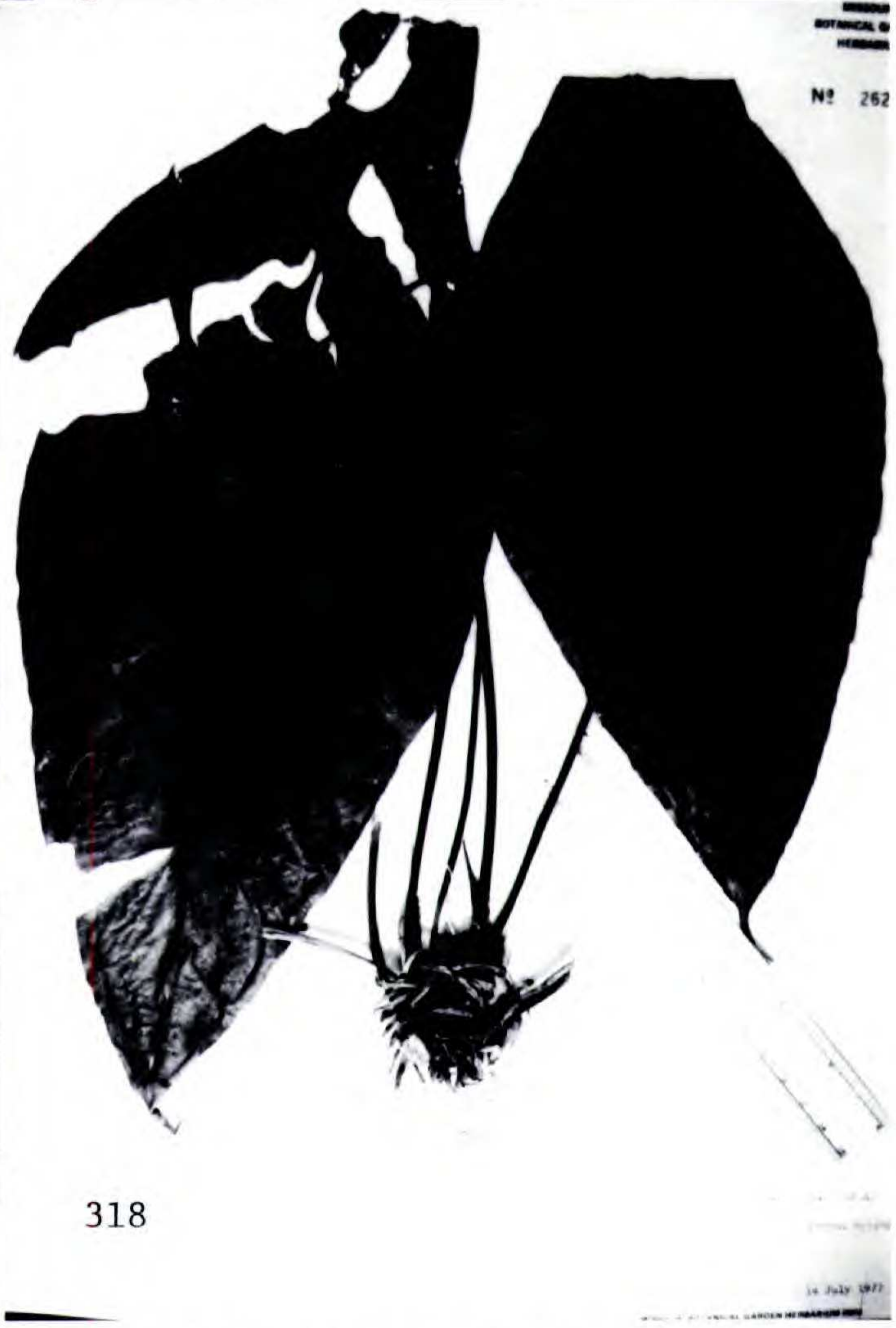
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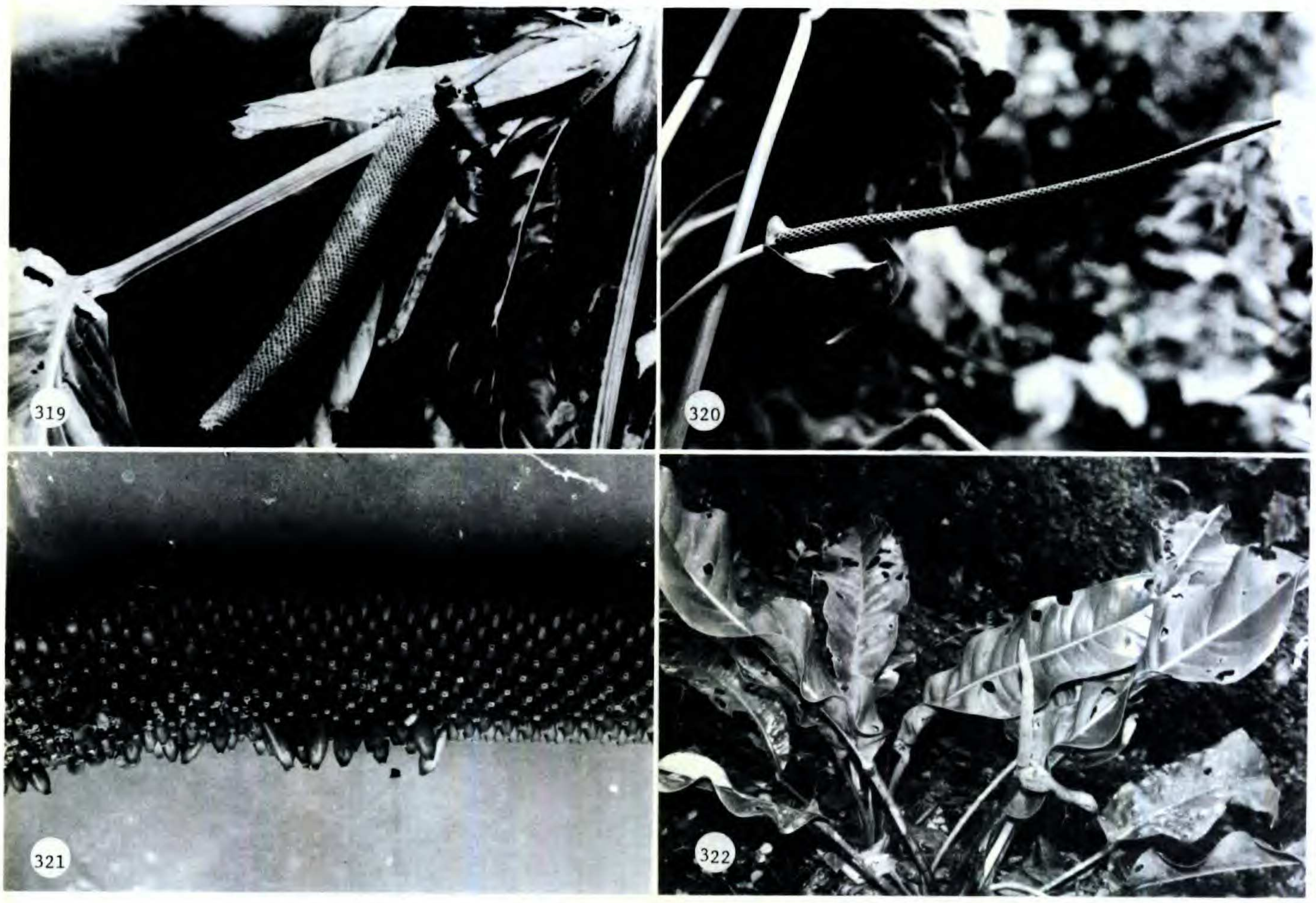
FIGURES 315-318.—315. *Anthurium uleanum* Engl. var. *uleanum*, *Croat 49661.*—316, 317. *A. uleanum* Engl. var. *uleanum*, *Croat 50412.*—318. *A. uleanum* Engl. var. *nanayense* Croat, *Foster 4227.*



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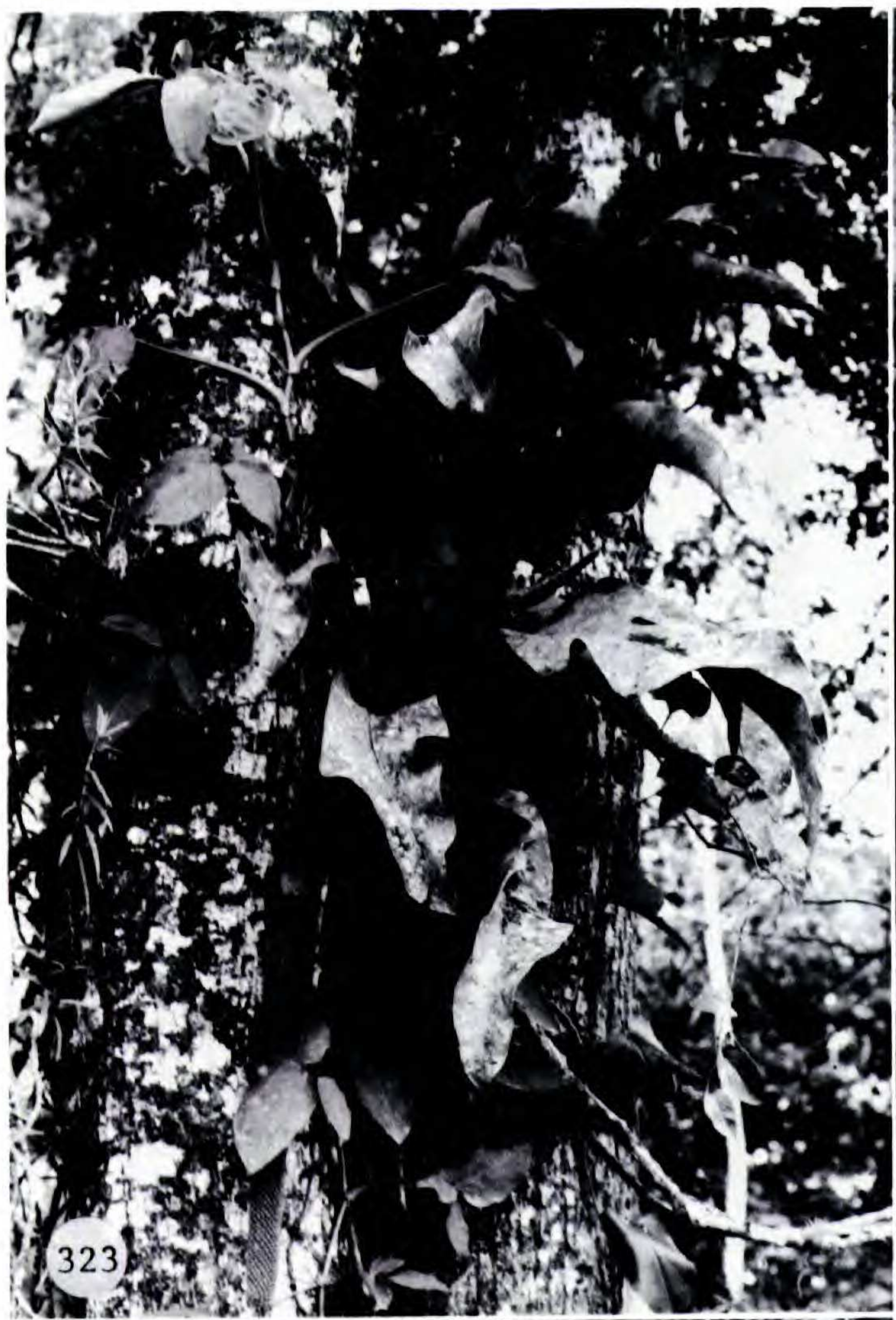

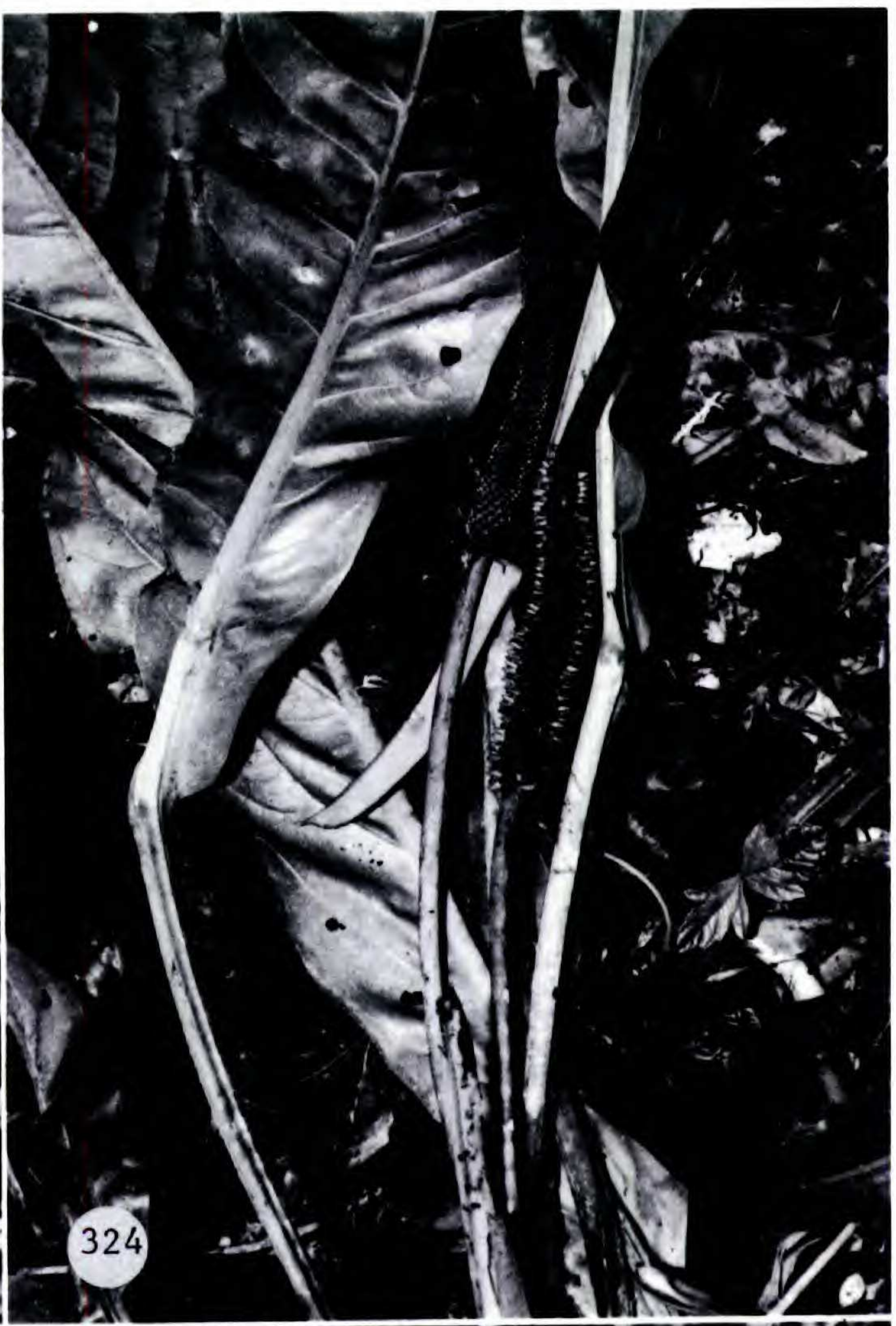

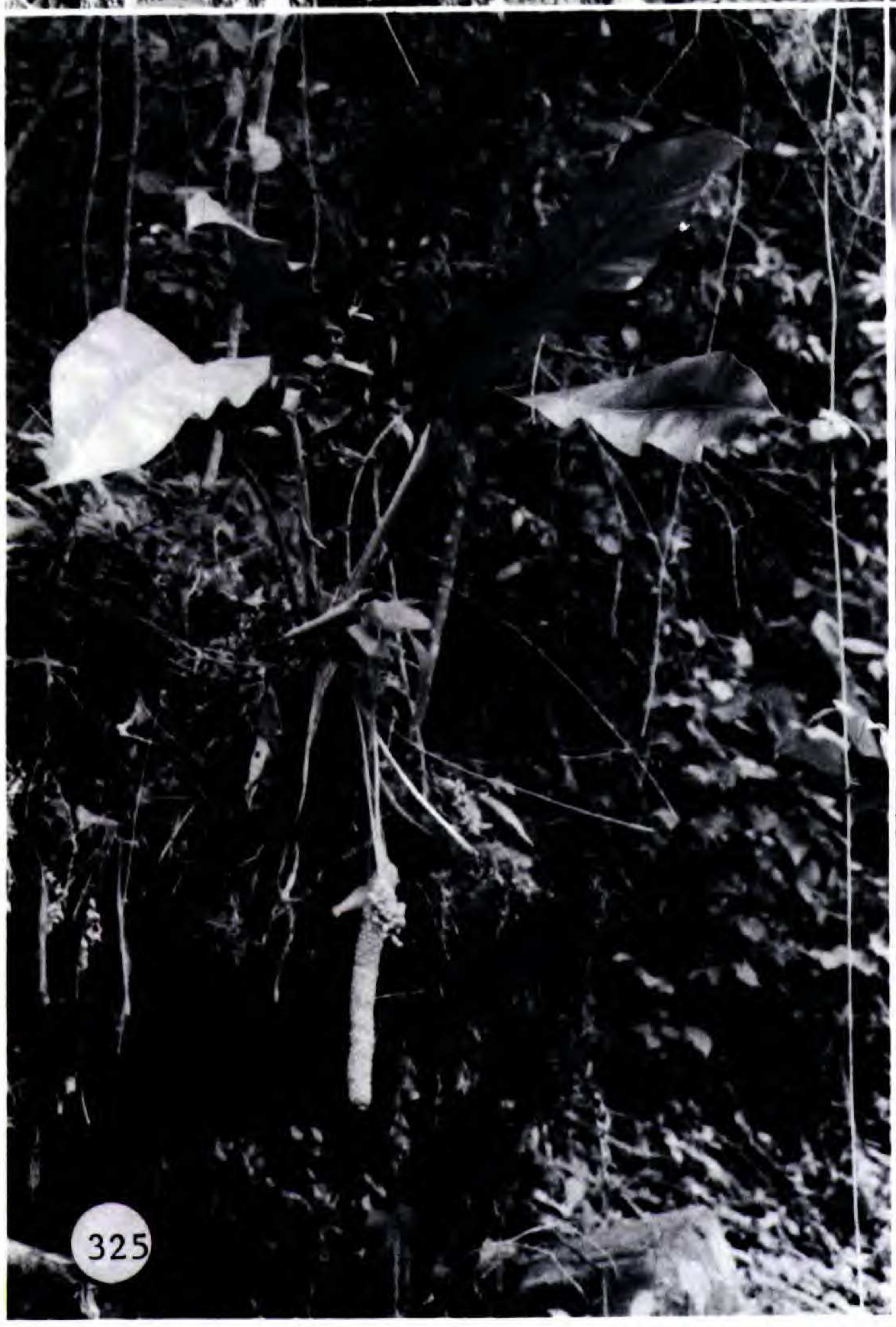

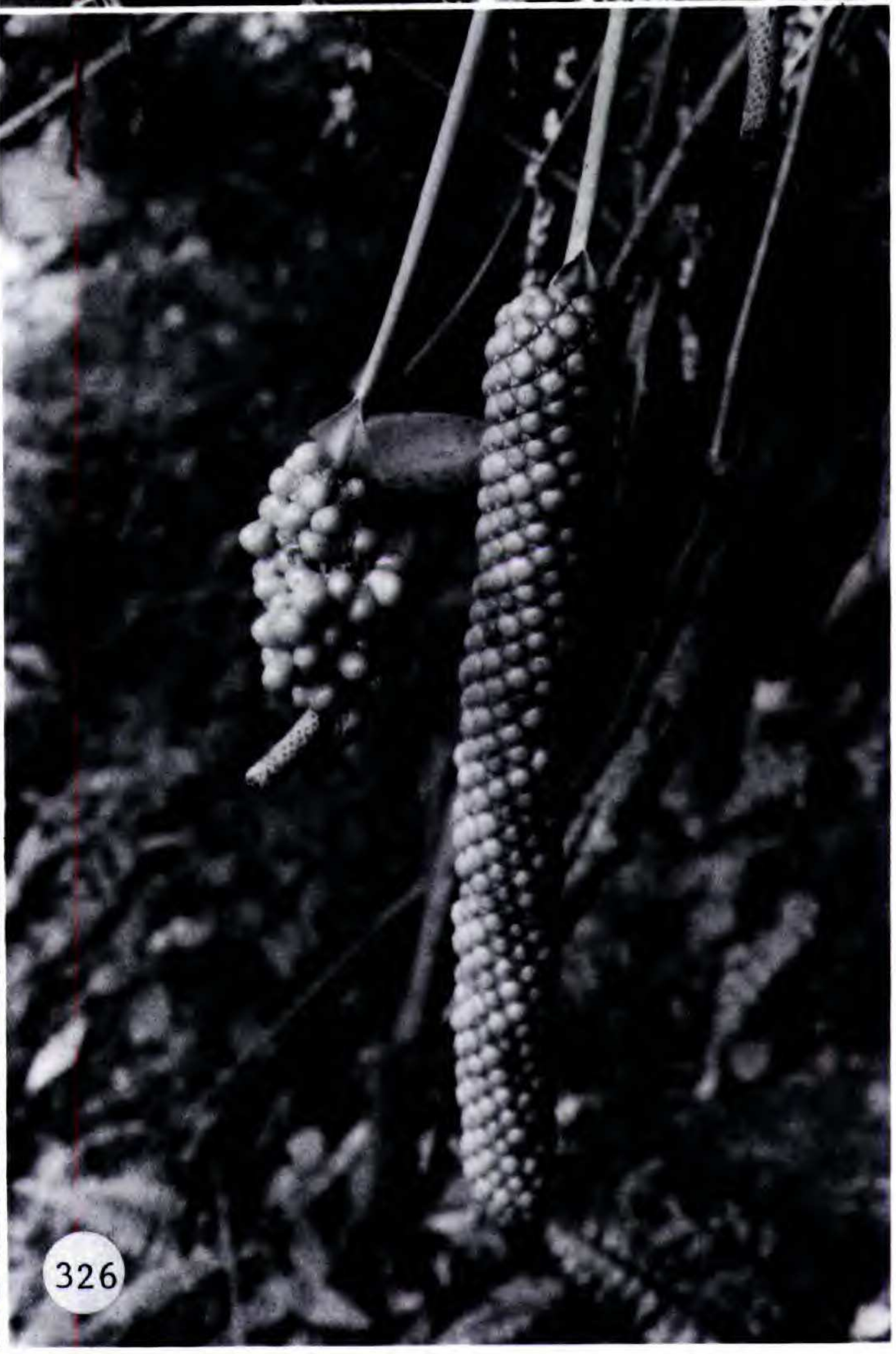

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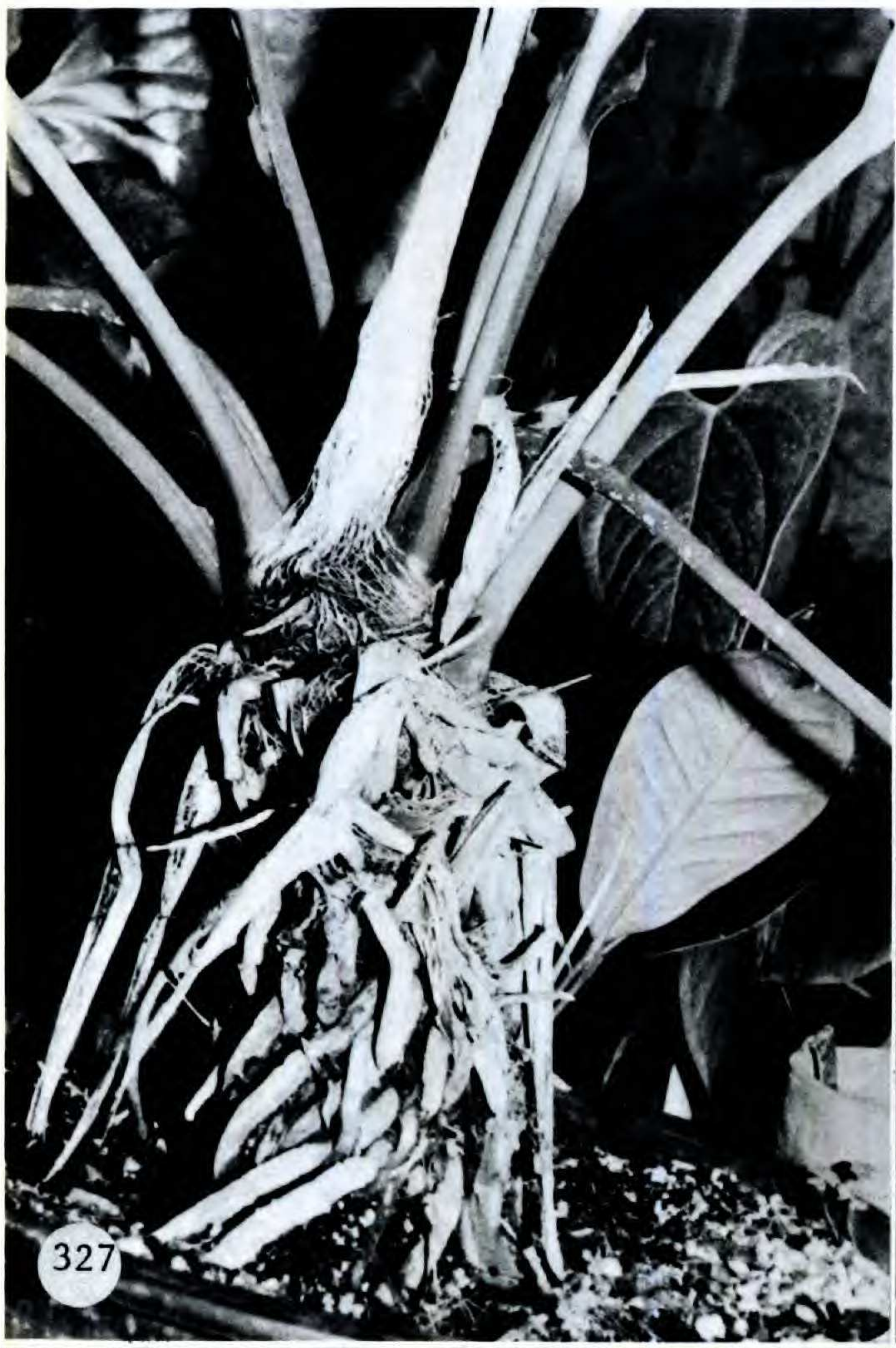

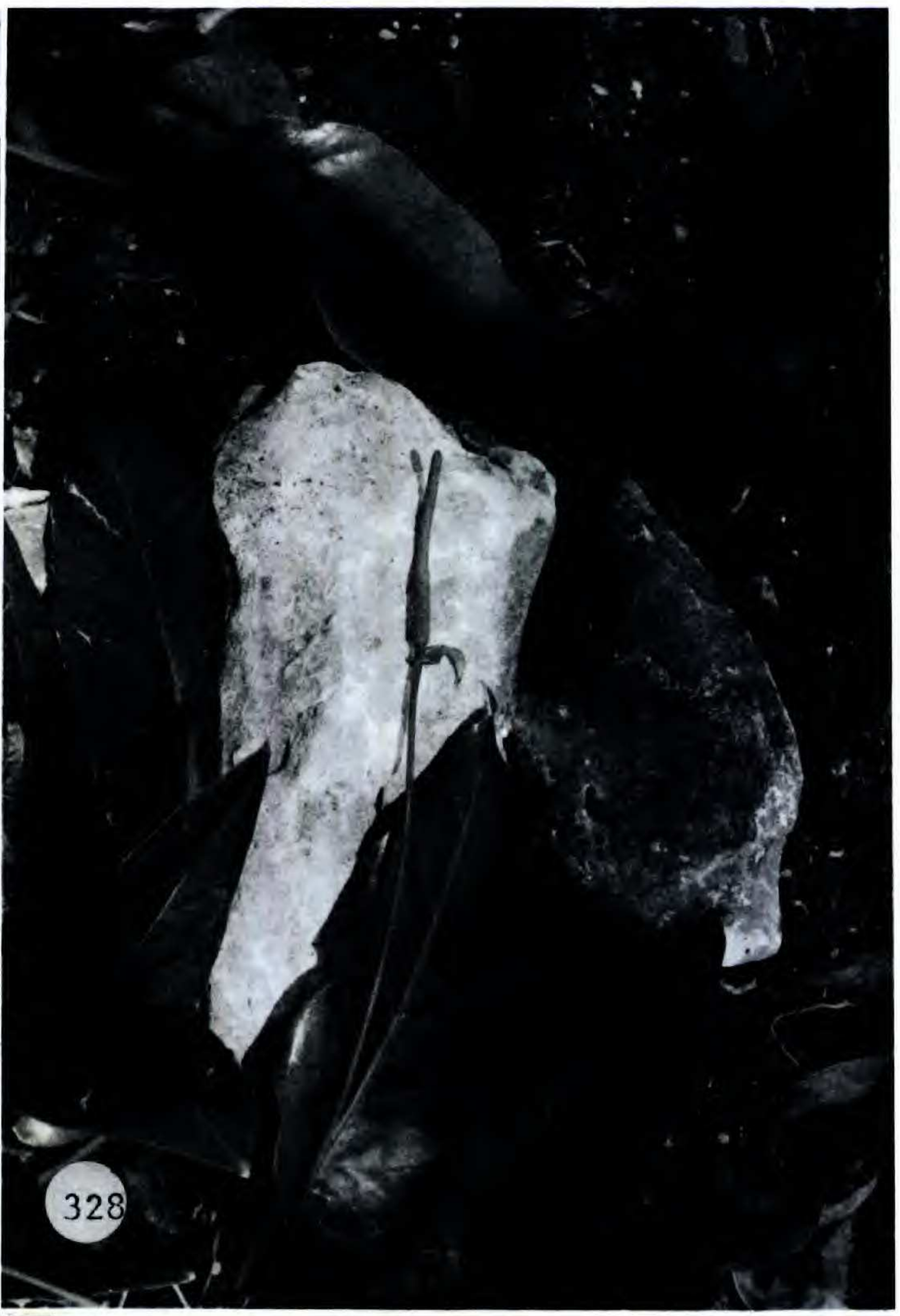

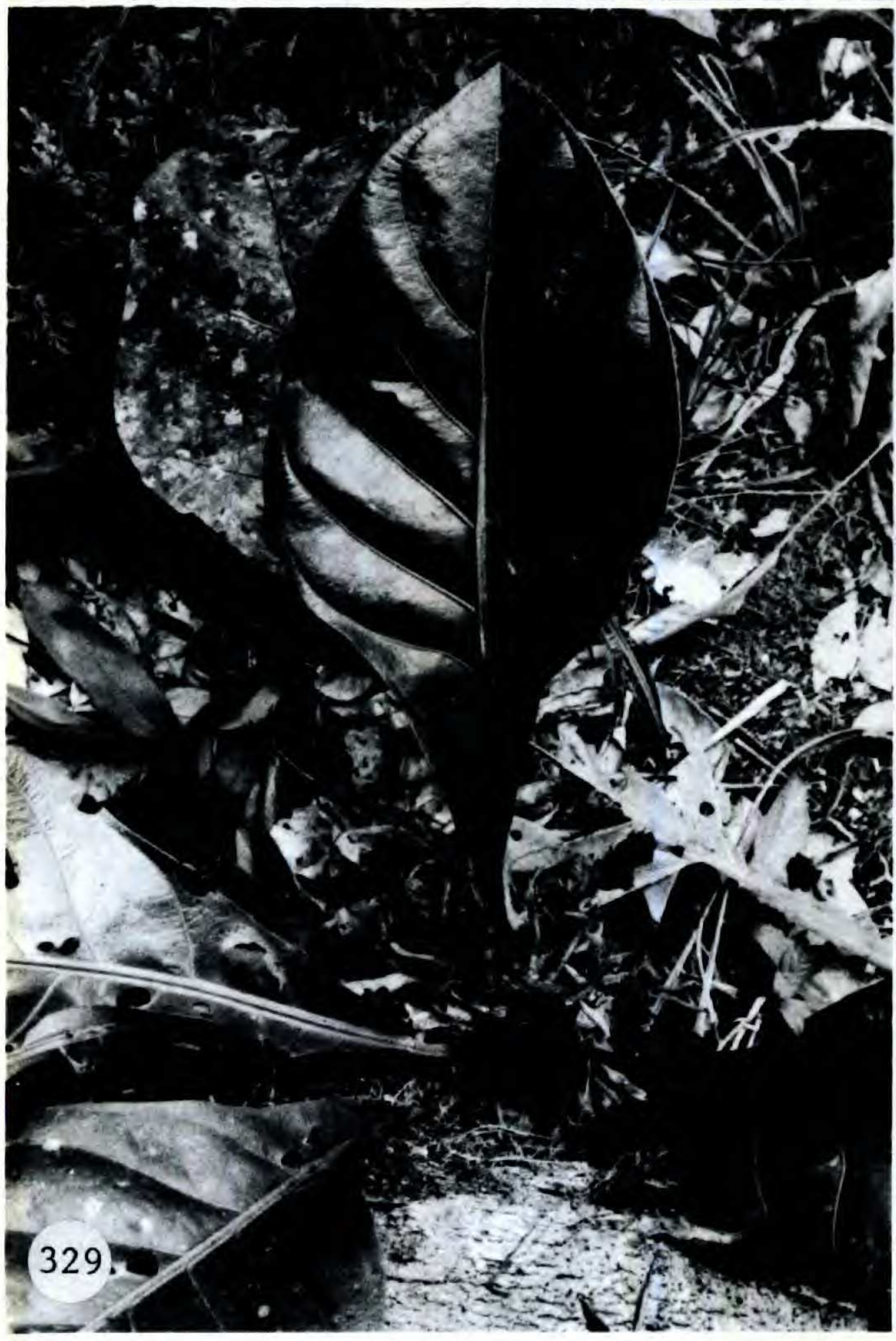

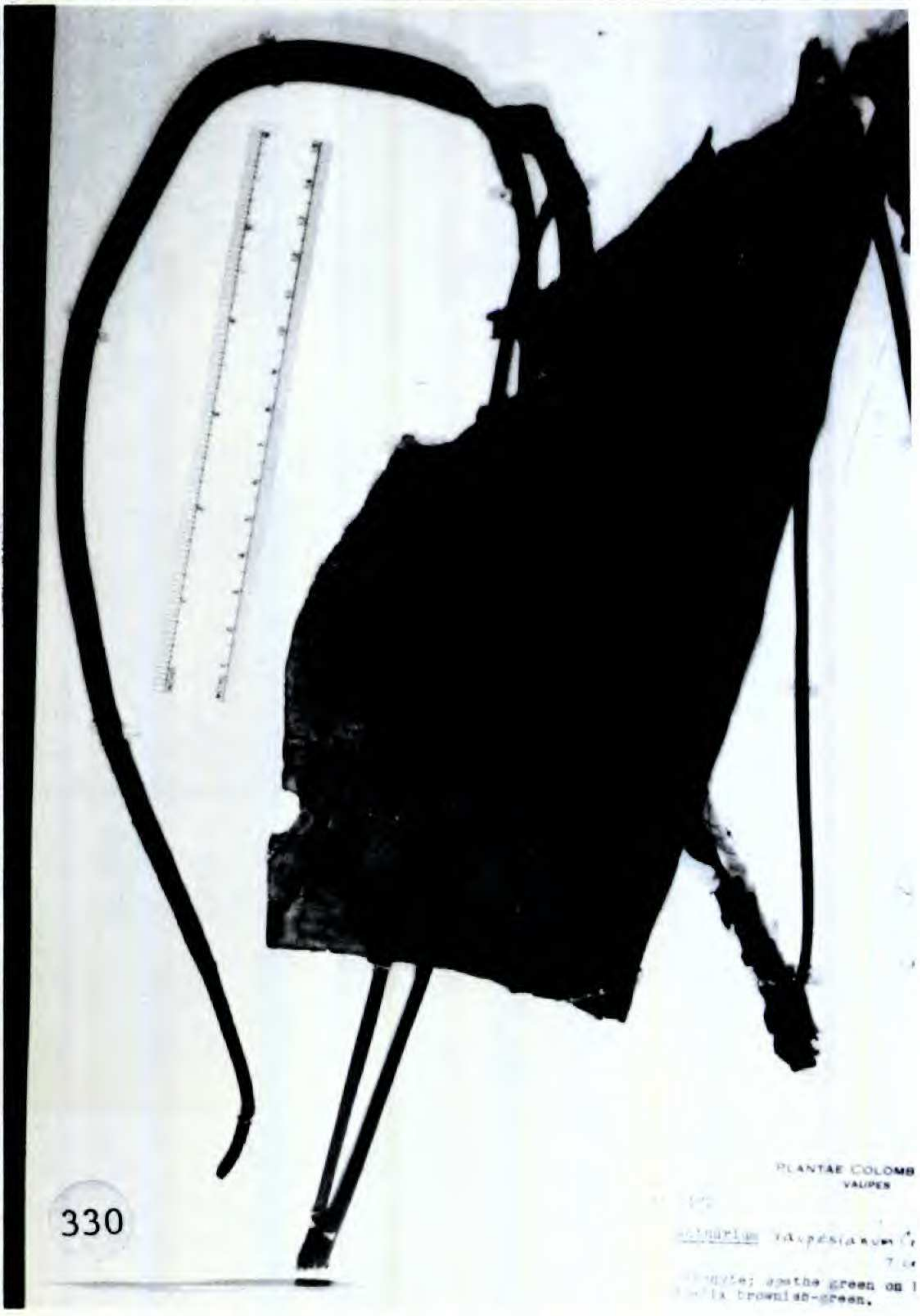
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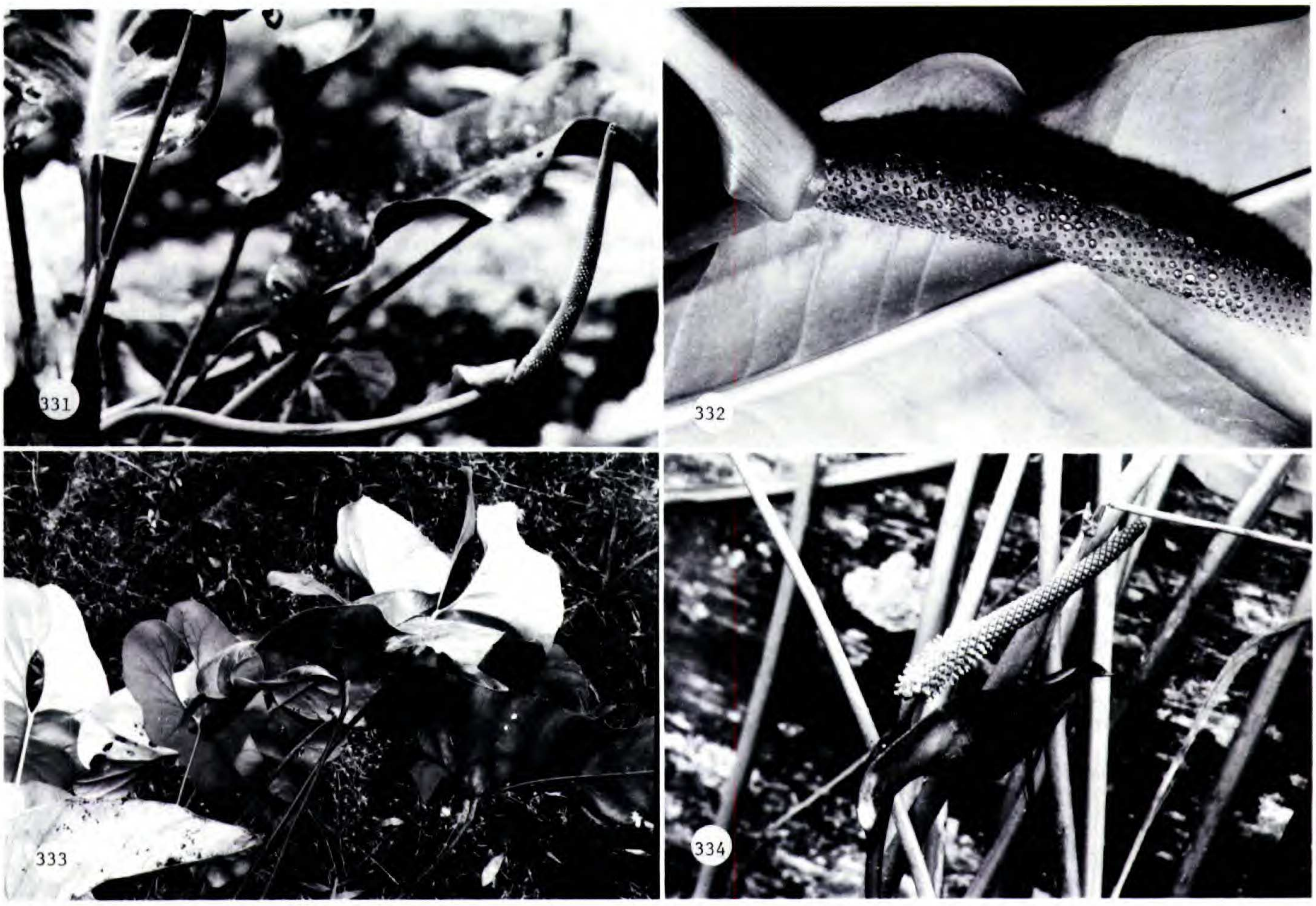

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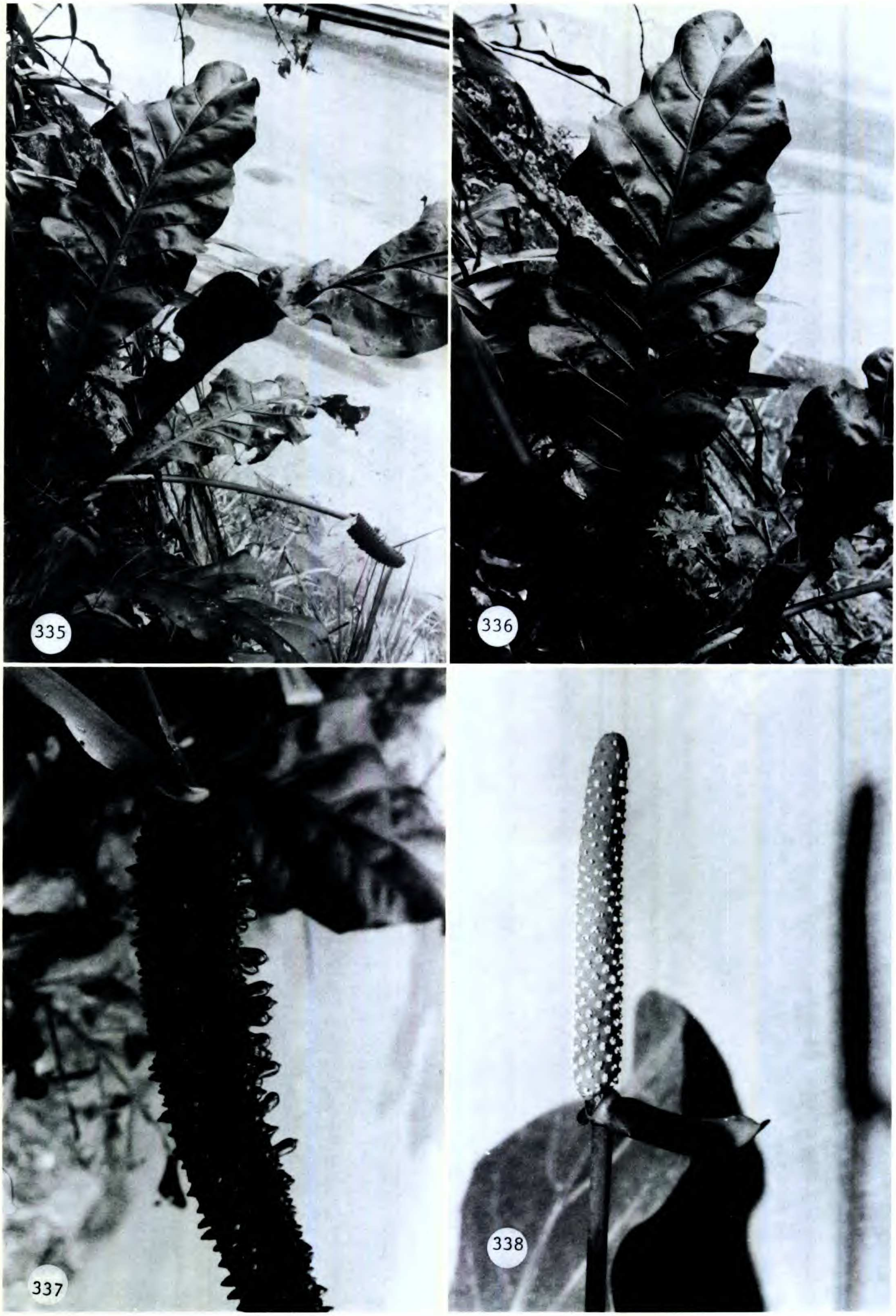
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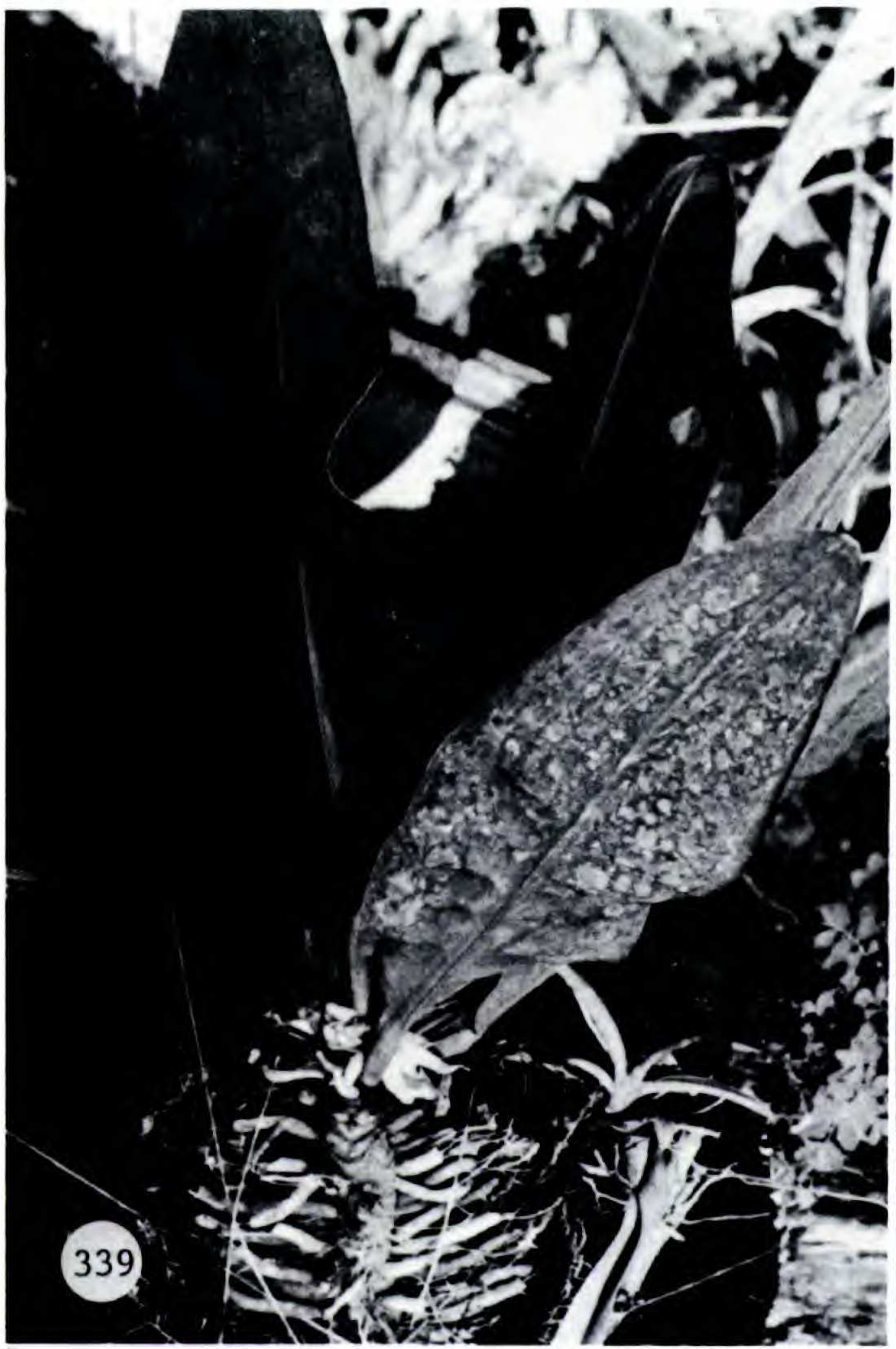

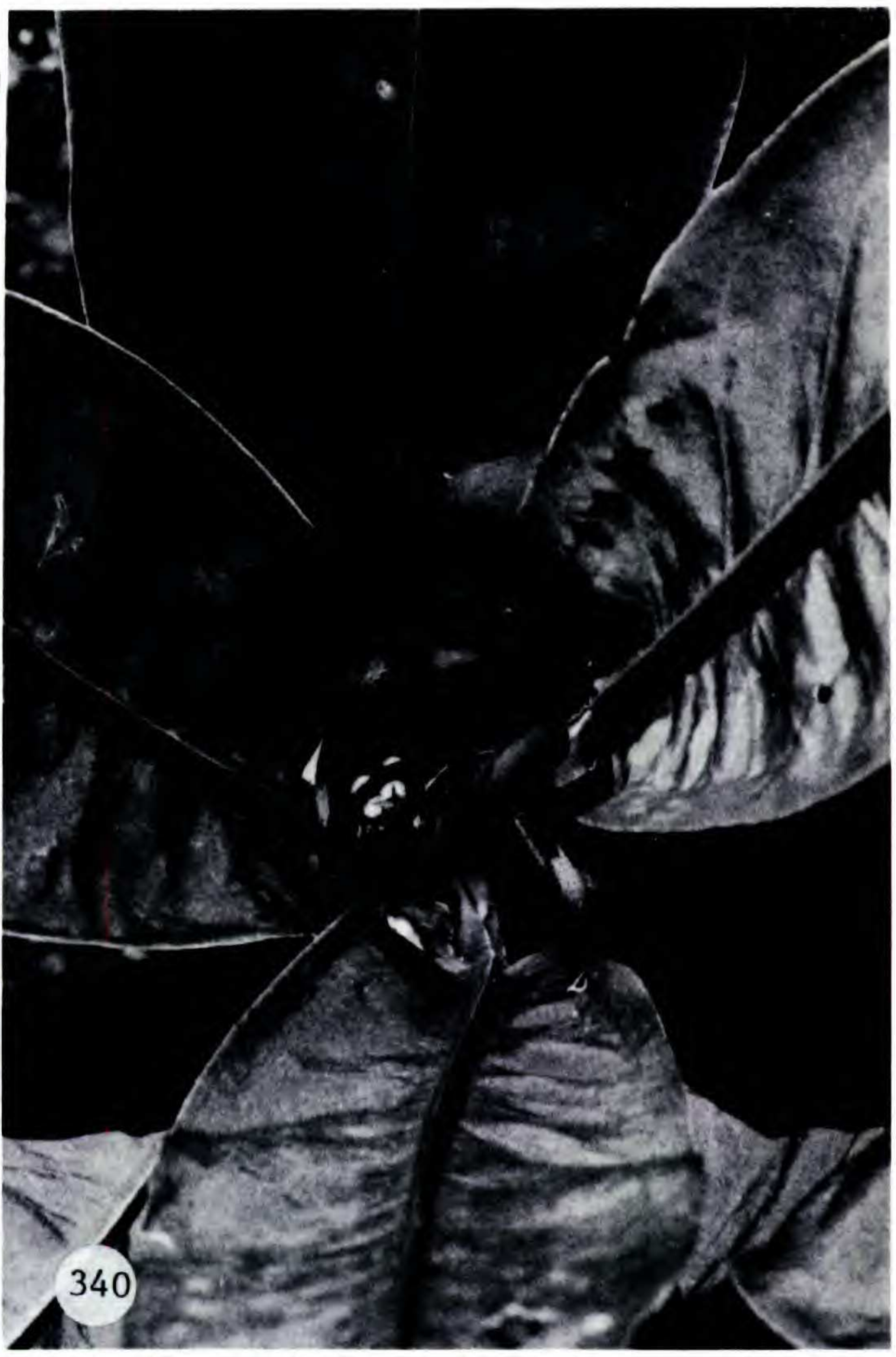

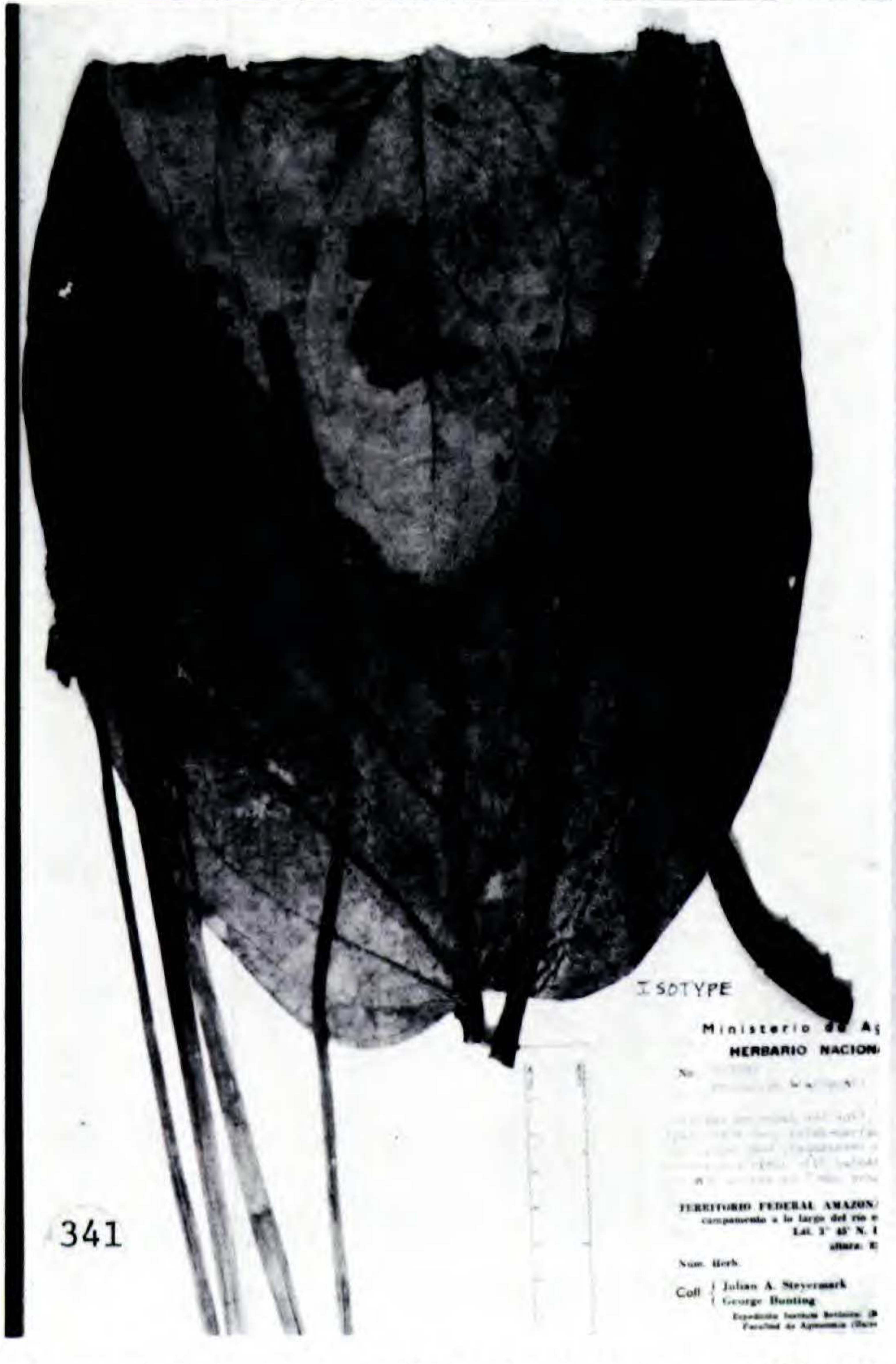
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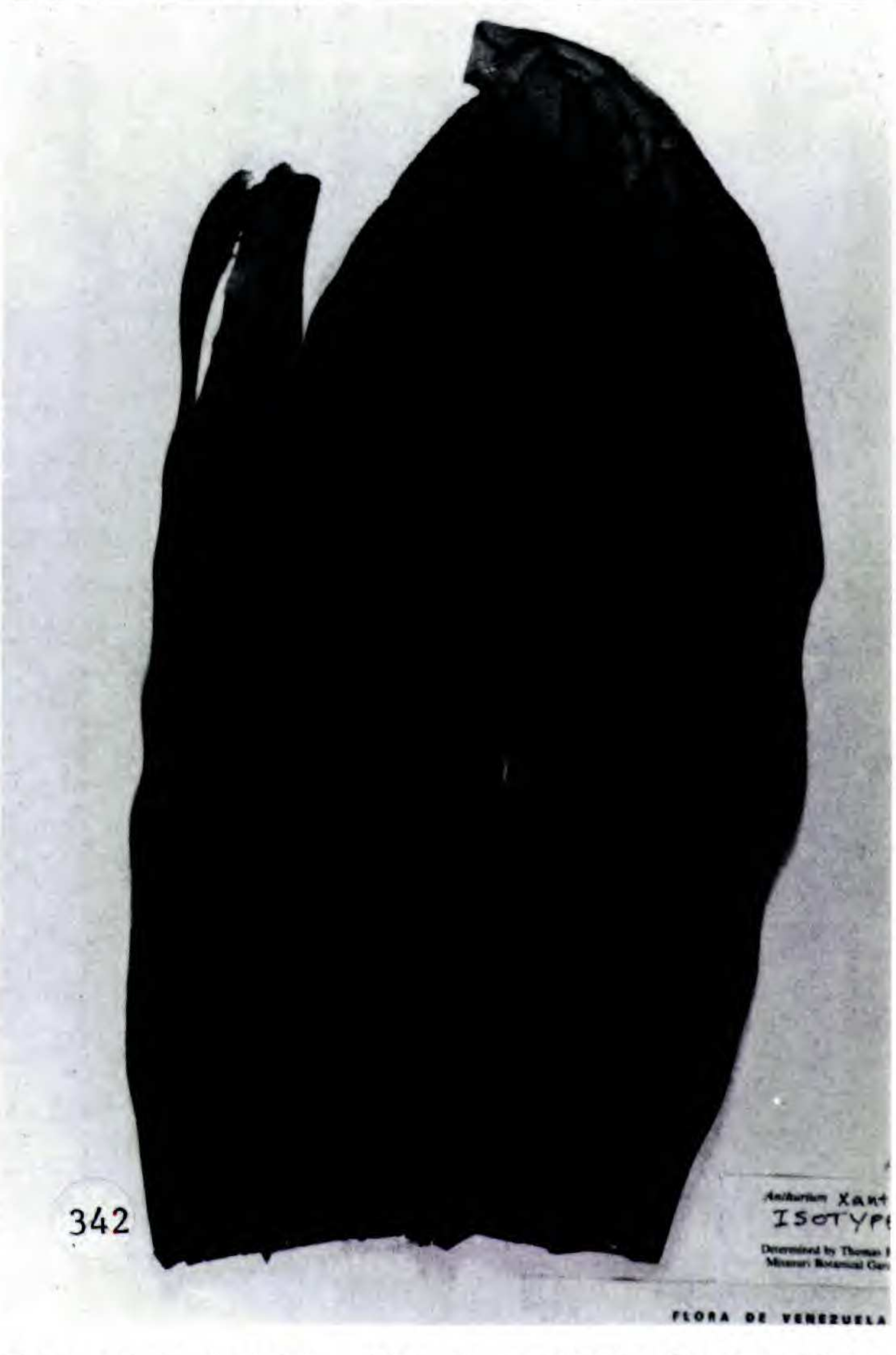
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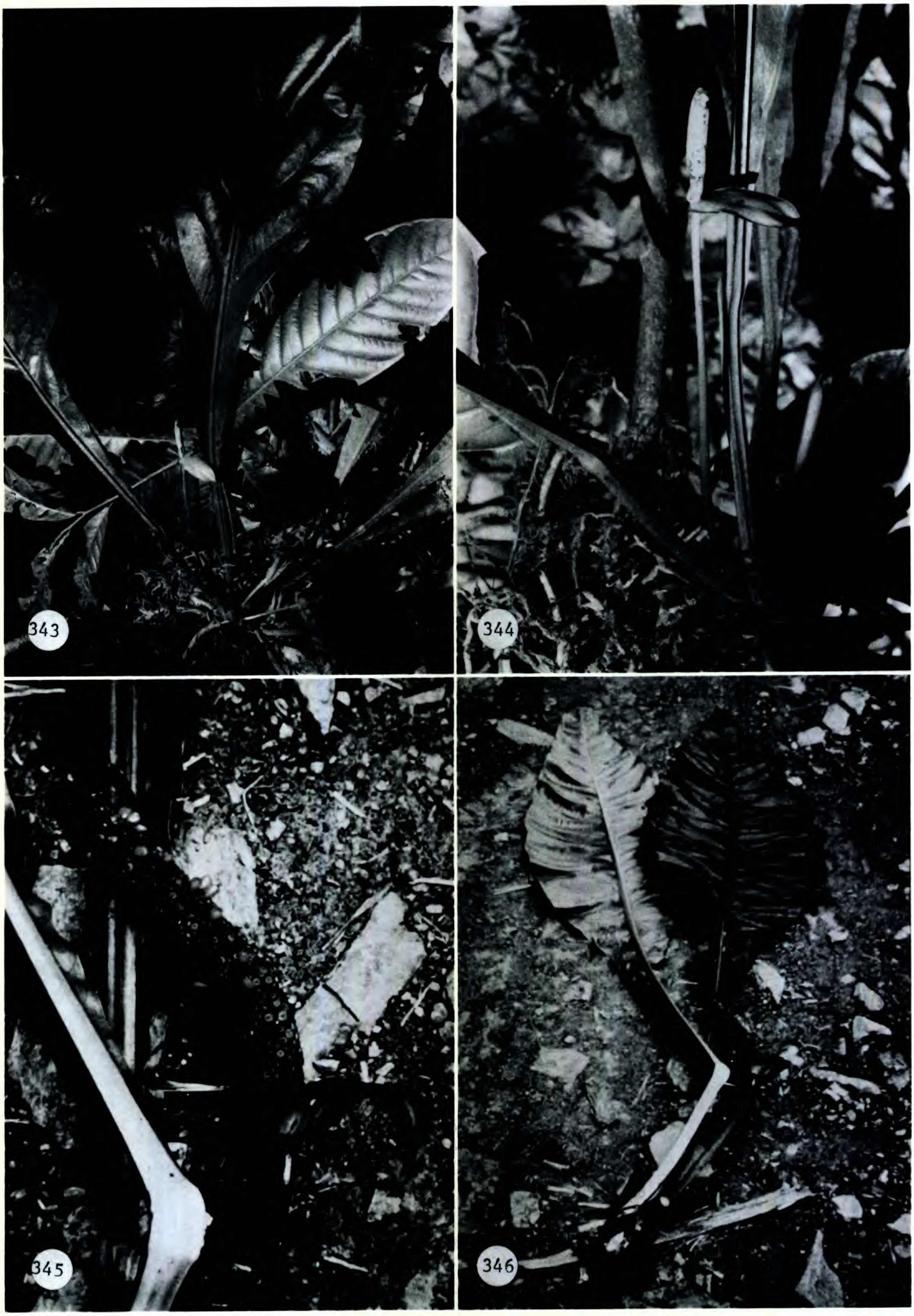

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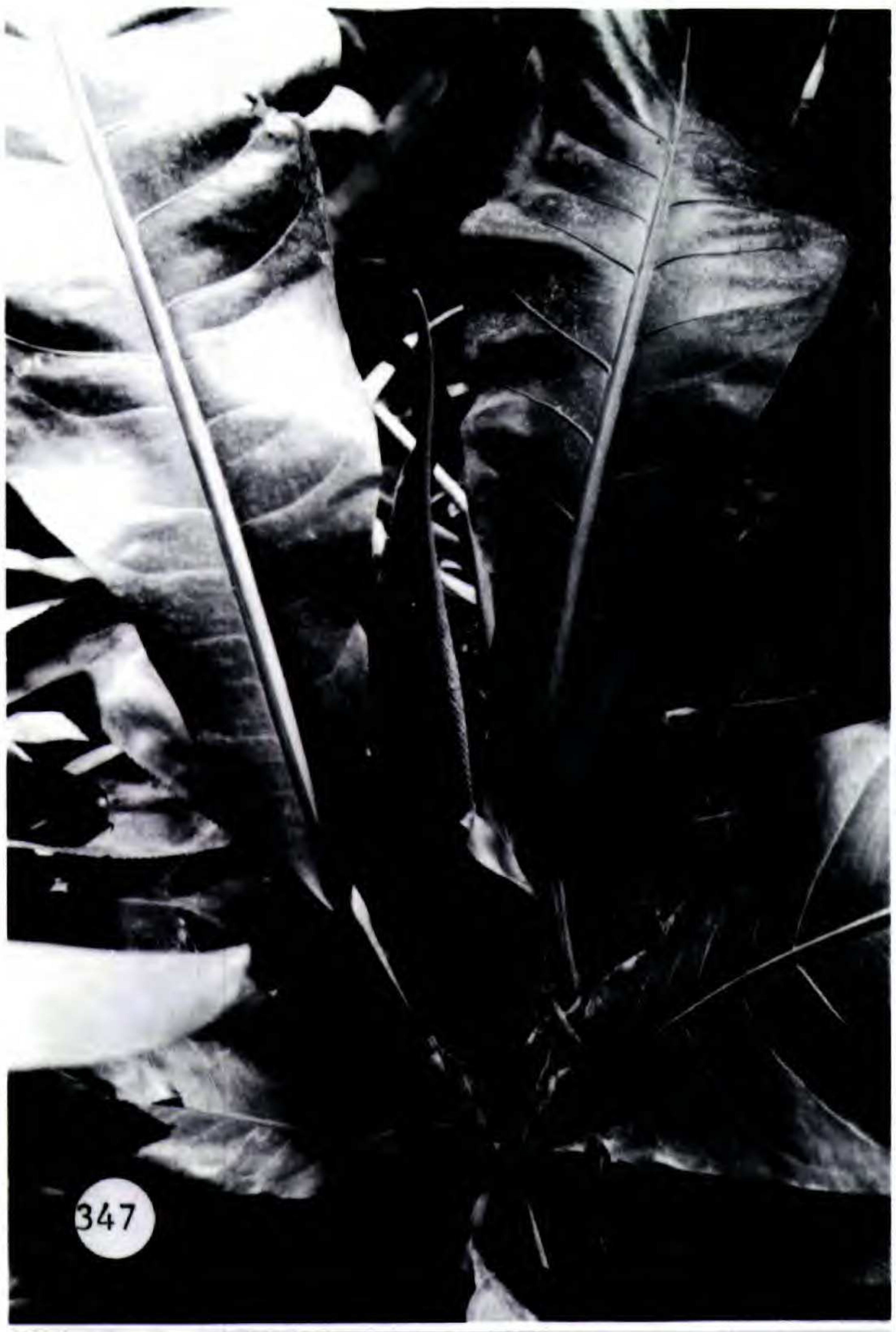

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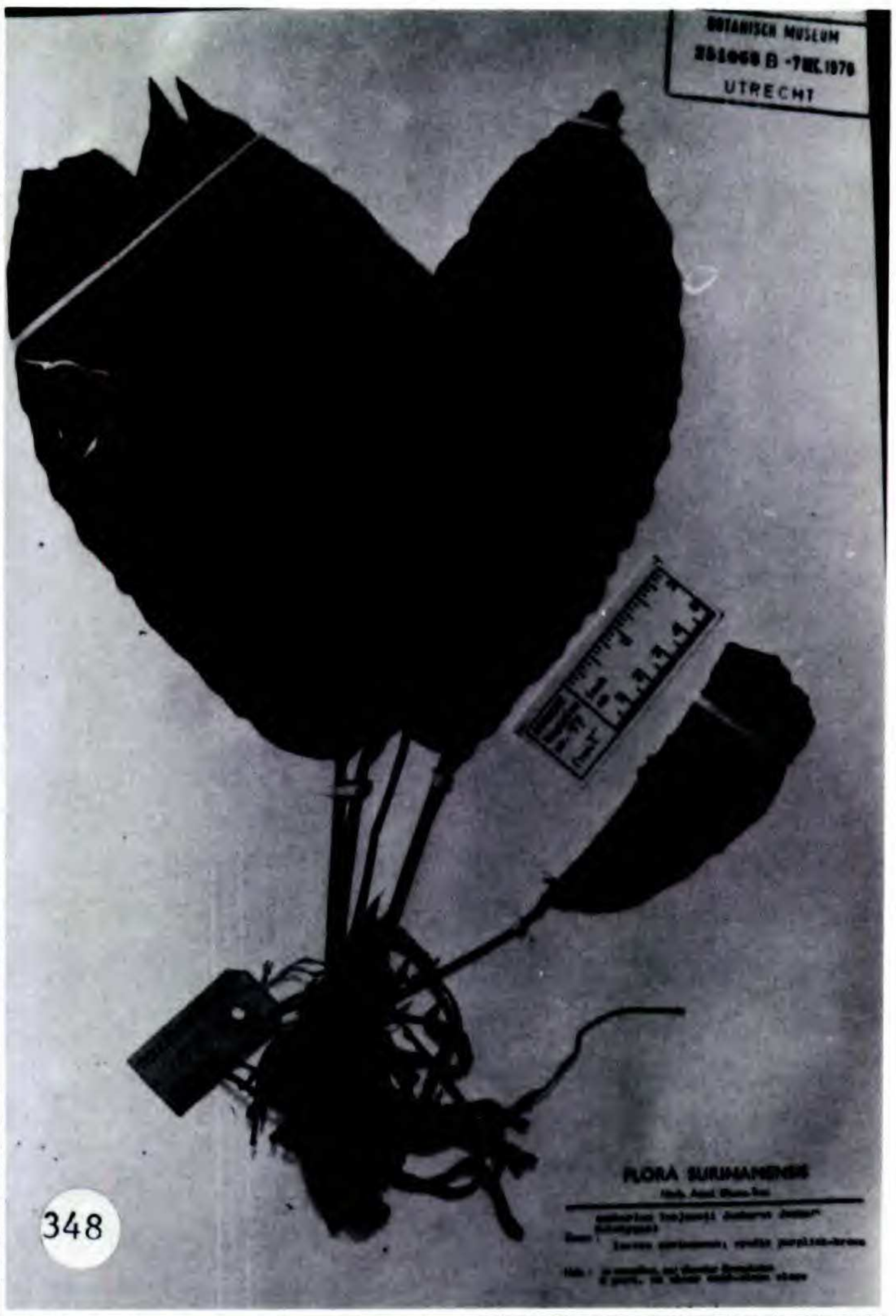

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UTRECHT
FLORA SURINAMENSIS

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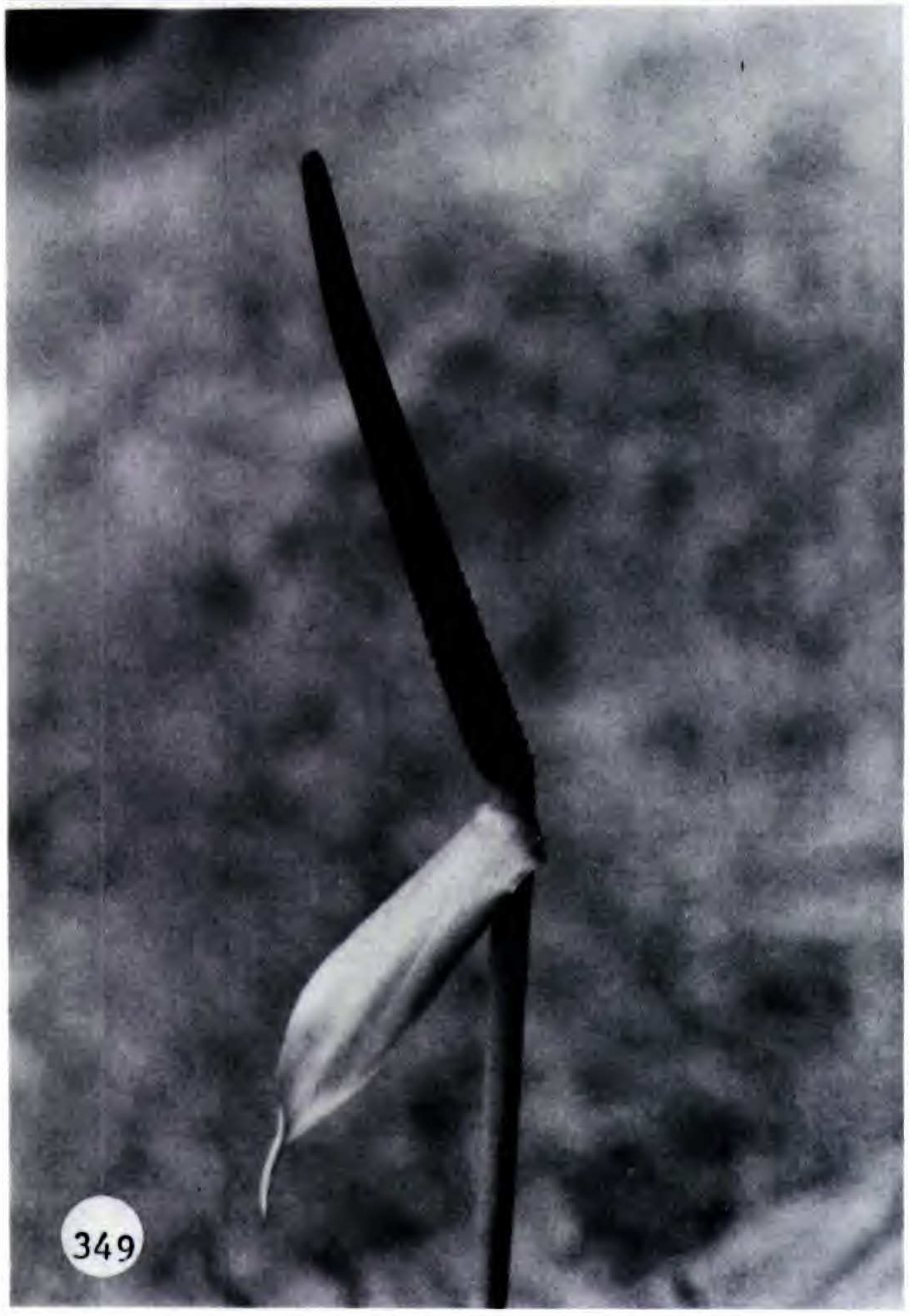

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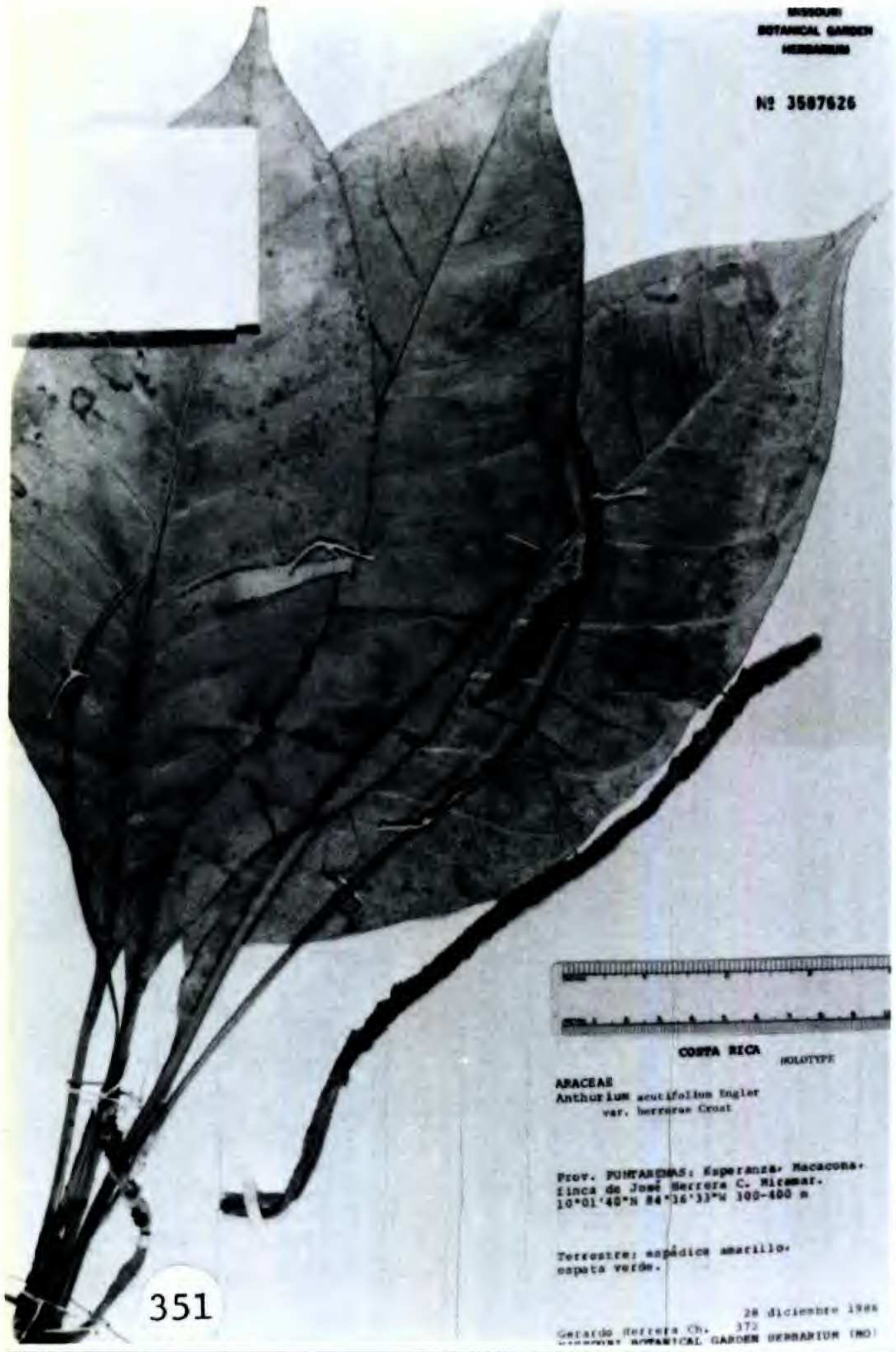
MISSOURI BOTANICAL GARDEN HERBARIUM
Nº 3587626
COSTA RICA
HOLOTYPE
ARACEAE
Anthurium acutifolium Engler
var. herrerae Croat
Prov. PUNTARENAS: Esperanza, Macacona, finca de José Herrera C. Miramar. 10°01'40"N 84°36'33"W 300-400 m
Terrestre; espádice amarillo, espata verde.
28 diciembre 1988
Gerardo Herrera Ch. 372
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)
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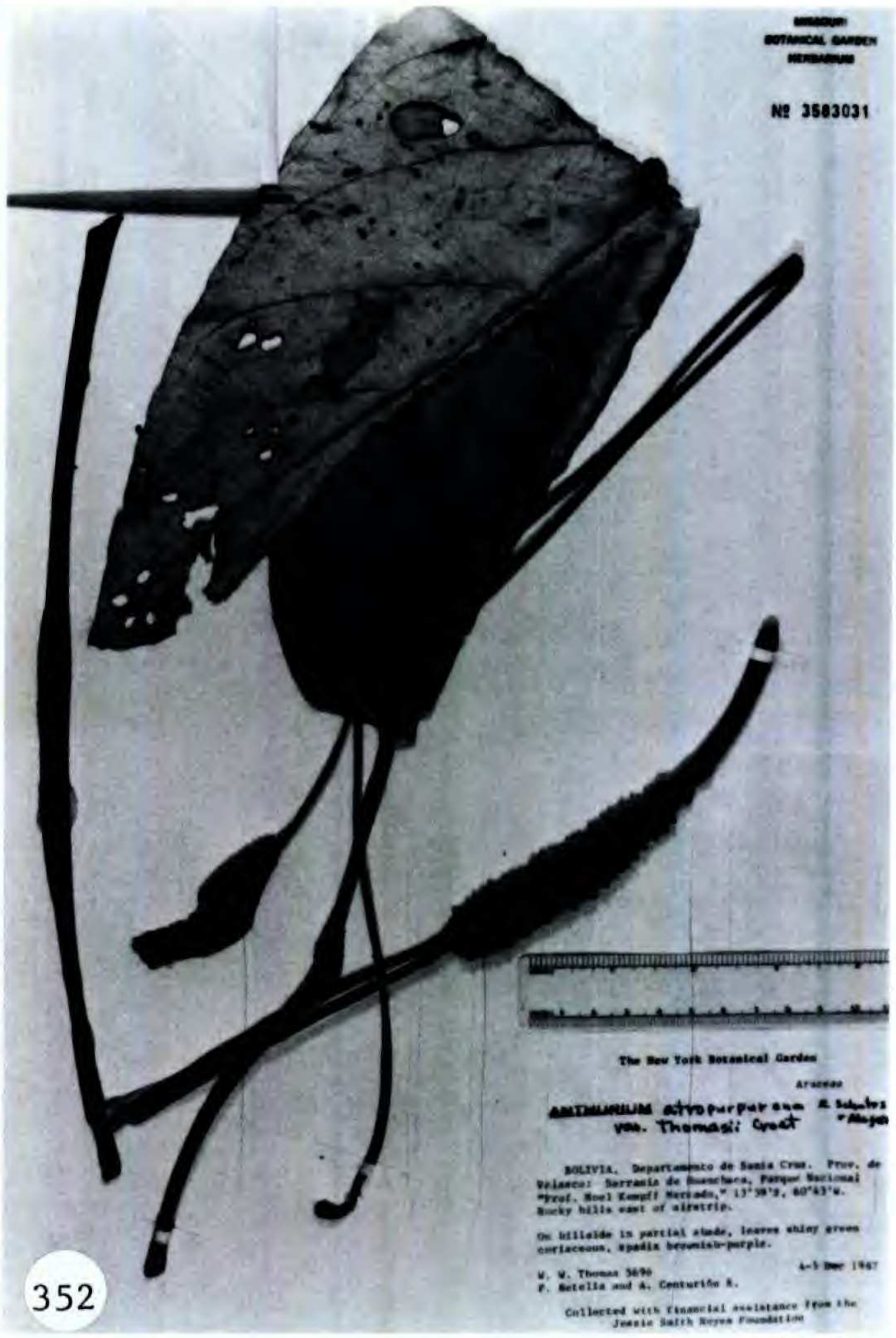
MISSOURI BOTANICAL GARDEN HERBARIUM
Nº 3583031
The New York Botanical Garden
Araceae
ANTHURIUM atropurpureum R. Schultes & Maguire
var. Thomasii Croat
BOLIVIA. Departamento de Santa Cruz. Prov. de Velasco: Serranía de Huanchaca, Parque Nacional "Prof. Noel Kempff Mercado," 13°38'S, 60°43'W. Rocky hills east of airstrip.
On hillside in partial shade, leaves shiny green coriaceous, spadix brownish-purple.
W. W. Thomas 5696
4-5 Dec 1987
F. Botella and A. Centurión S.
Collected with financial assistance from the Jessie Smith Noyes Foundation
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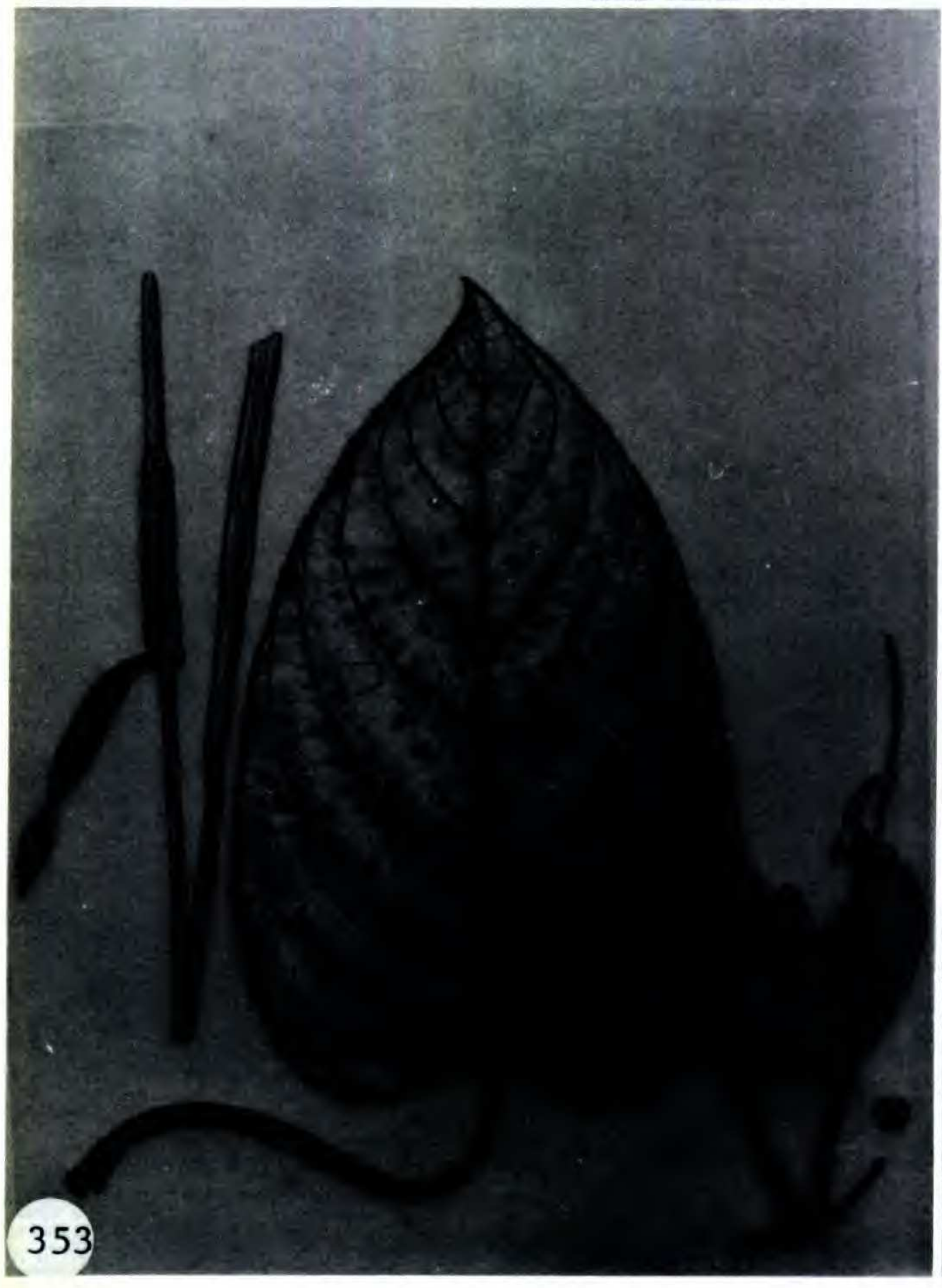

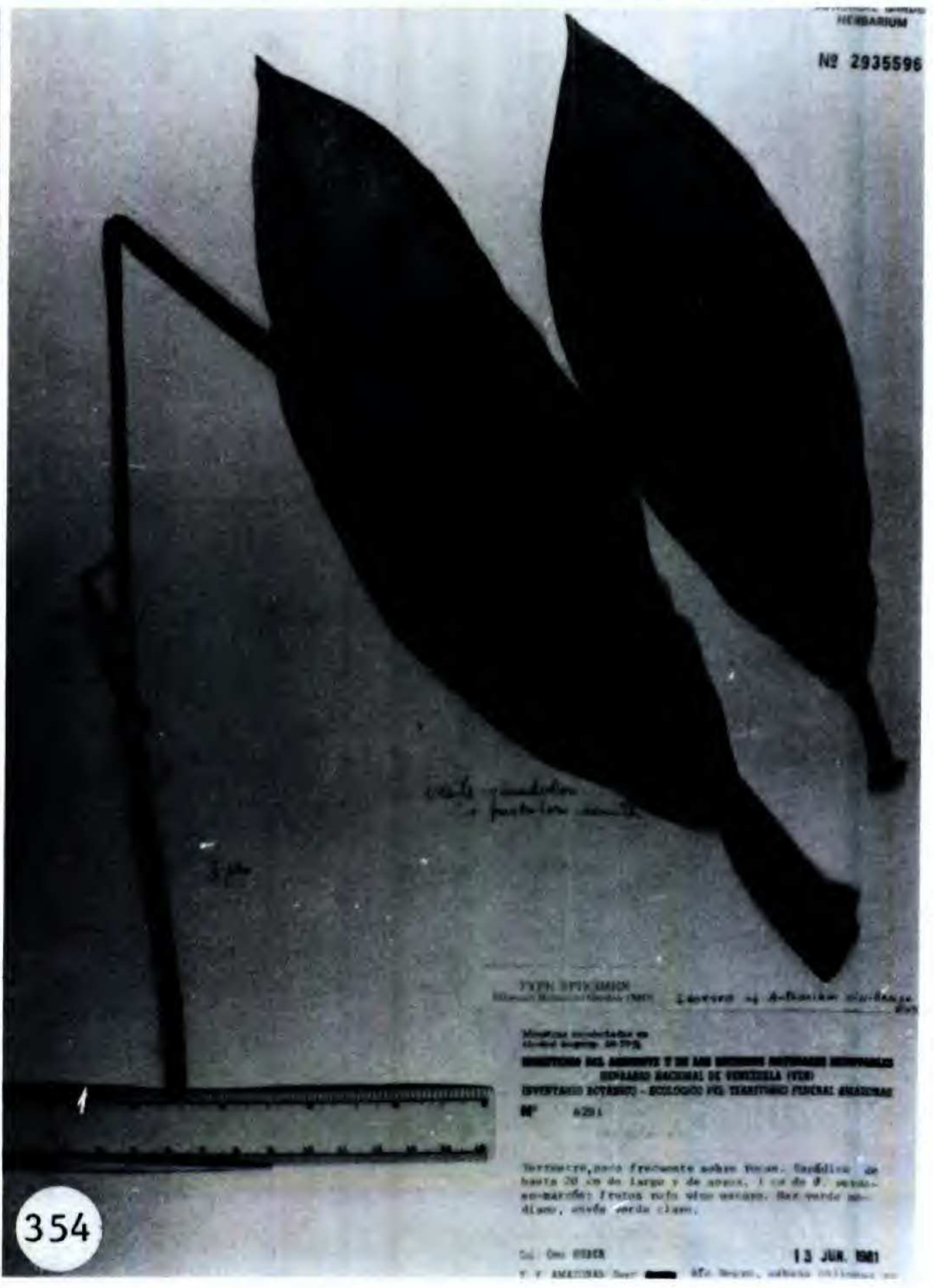
HERBARIUM
Nº 2935596
TYPE SPECIMEN
13 JUN. 1981
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